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LOYOLA UNIVERSITY CHICAGO

**BELIEF-DESIRE REASONING IN ZIMBABWEAN CHILDREN: A SEARCH
FOR EVIDENCE OF THE UNIVERSALITY OF A CHILD'S THEORY OF MIND**

**A DISSERTATION SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

ERIKSON INSTITUTE

BY

CHIPO DYANDA

CHICAGO, ILLINOIS

JANUARY 1998

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ABSTRACT

The study investigated the existence of an explanatory conceptual framework for reasoning about the mind called "belief-desire" psychology in eight-year-old, indigenous, schooled and unschooled Zimbabwean children. Two hundred children participated in the study. Three measures for assessing the presence of a theory of mind framed by belief-desire psychology were used to interview children. The measures were the Wellman and Bartsch mental states attribution, Wimmer and Perner false-belief and Perner, Leekam, and Wimmer unexpected change tasks. The study found that overall Zimbabwean children predominantly and competently use a belief-desire framework. They invoked the mental states of belief and desire to predict and explain every day, intentional, overt human actions. There were no statistical differences in performance between and within ethnic groups on two measures; the Wimmer and Perner, and the Perner et. al. On the Wellman and Bartsch, there was a significant difference in performance between schooled and unschooled children. The schooled children performed better than unschooled children.

CHAPTER I

INTRODUCTION

In the last decade, research studies (Astington, Harris, & Olson 1988; Wellman, 1992; Lewis & Mitchell, 1994) found that children from industrialized Western societies use a mode of reasoning about the mind, a conceptual explanatory framework called "belief-desire psychology." The purpose of this study was to investigate the existence of such an explanatory/conceptual framework in children from a less industrialized, non Western, but literate society. Specifically, the study sought to answer questions about the universality of belief-desire reasoning, by searching for evidence of its existence in eight-year-old, indigenous, schooled, and unschooled children in Zimbabwe. The topic emerged from the field of "a child's theory of mind", an area of investigation that re-emerged in the eighties, after its initial investigation by Piaget in the twenties (Feldman, 1992; Wellman, 1992; Wellman & Estes, 1986).

1.1. The meaning of a child's theory of mind.

In general, the field of "a child's theory of mind" deals with how children come to understand the nature and function of the mind in every day, intentional, and overt human action. An understanding of the mind, among other things, includes the knowledge and awareness that in people's "heads" exists an unobservable entity, container, and processor of information called the "mind." The child also learns that the contents of this mind include mental states such as beliefs and desires about the world; that it is the causal link between an individual's

beliefs and desires and his actions; and finally, that there is independence between the mind and the external world (Perner, 1991; Wimmer & Perner, 1983; Wellman, 1991; 1992; 1993; Astington & Gopnik, 1988, 1994; Flavell, 1988; Mitchell & Lewis, 1994; Wellman & Hickling, 1994; Perner & Davies, 1990; Wellman & Woolley, 1989).

1.2. An overview of the field of a child's theory of mind.

From studies in Developmental Psychology carried out in North America and Europe, the existence in children, of a mode of reasoning about the mind called belief-desire emerged (Wellman, 1992; Bartsch & Wellman, 1995; Bartsch & Wellman, 1989; Wellman & Bartsch, 1988; Astington & Gopnik, 1988; Wellman & Bartsch, 1994; Wellman, 1988; Butterworths, 1994; Wellman & Woolley, 1989; Astington, Harris, & Olson, 1988; Frye & Moore, 1991; Leslie, 1987). This mode of reasoning develops over time and consists of three major phases. According to Wellman (1988, 1991, 1992, 1993), and Bartsch and Wellman (1989) the first stage is predominantly influenced by desires at the exclusion of beliefs (simple desire psychology). The second reflects a predominance of desires with occasional reference to beliefs (desire-belief psychology), and finally, reasoning that considers both beliefs and desires (belief-desire psychology). Each phase reflects qualitatively different knowledge, processes, and understandings of the nature and function of the mind in everyday, intentional, and overt human actions. Together, these stages form an identifiable, definable, and "theory-like" explanatory framework to account for phenomena about the mind in every day, intentional, overt human action (Wellman, 1988, 1992; Bartsch & Wellman, 1988).

Within this explanatory framework, studies have examined the knowledge base (Beal, 1988; Robinson, 1994; Wimmer, Hogrefe & Perner, 1988), processes and developmental

milestones such as understanding the representational nature of the mind (Wimmer & Perner, 1983; Astington & Gopnik, 1991; Chandler, Fritz, & Hala, 1989; Gopnik & Graf, 1988; Ruffman & Olson, 1989; Keenan, Ruffman & Olson, 1994; Sodian, Wimmer, 1987; O'Neil & Gopnik, 1991; Perner & Ogden, 1988; Perner, 1988; Gopnik, Slaughter, & Metzoff, 1994; Yaniv, & Shatz, 1988; Wimmer, Hogrefe & Sodian, 1988; Gopnik & Slaughter, 1994; Taylor, 1988; Gopnik, Slaughter, & Meltzoff, 1994;), and phases through which children pass towards an adult-like belief-desire explanatory system (Wellman, 1988, 1992, 1993; Bartsch & Wellman, 1989; Astington, 1993; Fodor, 1992, 1987; Wellman & Bernajee, 1991, 1995; Wellman, & Woolley, 1989; Wellman & Bartsch, 1994).

1.3. Conceptual frameworks for a child's theory of mind.

Although there is a consensus that children develop a conception of the mind during childhood, the theoretical explanatory perspectives framing and explaining its nature, origin, and development are diverse. Astington and Gopnik (1991), Bower (1993), Perner (1991), and Wellman (1992) identify and outline these views as the theory-theory, innate predisposition, enculturation, simulation, and information processing. The theory-theory view suggests that during childhood, children construct a coherently organized theoretical explanatory system, a mode of reasoning about the mind such as belief-desire. The explanatory framework, they argue, is not innate but is gradually constructed by the child from experience (Wellman, 1992; Perner, 1991; Astington & Gopnik, 1991; Bower, 1993). The proposition that children gradually construct an organized coherent body of knowledge, an explanatory framework to think and reason about the mind is one of the reasons a child's understanding of the mind is called a "theory", and the field as a whole , "a child's theory of mind."

The "innate predisposition" perspective espouses three similar, but separate views. First is the view that maturation is responsible for the development of an understanding of the mind; second, that human beings are born with a Theory of Mind Module (ToMM) responsible for the development of a theory of mind (Baron-Cohen & Ring, 1994; Baron-Cohen, 1991; Leekam & Perner, 1991; Leslie & Thaiss, 1992; Bower, 1993; Leslie, 1991) and third, by Fodor (1987) and Sterelny (1993). Fodor and Sterelny proposed and argued that a conception and development of a theory of the mind is a universal phenomena in humans. In fact, Premack and Woodruff, the researchers who launched the beginning of these investigations in the late seventies, suggested from the outset, that a major aspect of theory of mind, that of imputing and inferring from mental states, was universal in human beings (1978). The overall perspective of innate predisposition is reflected by the following quotes from two of its strongest proponents:

There is so far as I know, no human group that doesn't explain human behavior by imputing beliefs and desires to the behavior. And if an anthropologist claimed to have found such a group I wouldn't believe him... (Fodor, 1987 cited in Avis & Harris, 1991:1)

....A theory of mind may be the next best candidate after language for a cultural universal... Sterelny (1993:83).

The "enculturation hypothesis" suggests that modes of thinking, including reasoning about the mind are by-products of culture. This position, although more popular with anthropologists, nonetheless, has support from developmental psychologists such as Robinson (1994), Rogoff (1990), and Butterworths (1994). Butterworths (1994) said that culture is the basis for epistemological theory about the mind, because each culture and/or environment defines the knowledge base from which a theory of mind is constructed; while

Rogoff (1990) and Robinson (1994) believe culture defines the content, processes, tools, goals, outcomes and priorities for understanding the mind. Anthropologists (Heelas & Lock, 1981; Kim & Berry, 1993) also hold the same views as Robinson (1994), Rogoff (1990), and Butterworths (1994). These views put limitations on the generalization of a conception of the mind across cultures including any attempts to assert its universality.

The last two, less comprehensive, views are the simulation and the information processing theories. Both oppose the theory-theory proposition that children construct a theoretical framework to reason about the mind. The simulation theory argues that children do not construct a theoretical explanatory framework at all and need not do so. Their understanding of self and other people's mental life is through introspection and projection of their own mental life experiences onto other people (Johnson, 1988; Harris, 1990, 1992). The information processing theory suggests that children's growth in their understanding of the mind is not due to a gradual construction of more comprehensive and competent explanatory framework such as belief-desire, but is an elaboration of the existing general cognitive capacities such as memory, language and thought (Astington & Gopnik, 1991).

Of these perspectives, the theory-theory argument has been the most productive in terms of research. The others have remained largely theoretical and speculative. The theory-theory tradition therefore, guides this investigation, however, other perspectives also frame the problem and justification for the study.

1.4. Statement of the problem and justification for the study

The problem for this study is framed by three issues that emerge from Western based research studies on children's understanding of the mind. The first issue relates to what Feldman (1992) describes as a Kuhnian post-Piagetian paradigm shift from studying children in isolation from their environments to situating development in social context. Feldman (1992) believes that the social nature of, and/or basis for understanding the mental lives of the self and other people demands that investigations about children's understanding of the mind to be situated in cultural context. Learning to understand the self's and other people's mental lives is embedded in culture because culture scripts the content, process, outcomes, tools and/or medium and context for developing such understandings. One of those scripts is "folk psychology," a socially constructed domain of knowledge (Heelas & Lock, 1981; Kim & Berry, 1993; Forguson & Gopnik, 1988; Whiten, 1991). Although folk psychology is a domain of knowledge concerned with the prediction and explanation of everyday, intentional overt human action, competency in that "enterprise" depends on a competent understanding of how one's own and other's minds work. For that reason, folk psychology becomes not only a cultural tool for developing an understanding of the mind, but a context, medium, and process through which that understanding is developed and may therefore be examined. Developmental phenomena such as a child's theory of mind thus, need to be situated in cultural context.

The second issue emerges from competing hypotheses such as the theory-theory and innate predisposition. On one hand, it appears that an understanding of the mind has a social and

cultural basis, yet on the other, it is equally reasonable and appealing to assume that humans as a species have common characteristics. These characteristics not only differentiate humans from other species, but make them similar irrespective of cultural context. These competing hypotheses create ambiguities for non Western cultural societies where studies have not yet been conducted. Research in those cultures may help clarify such ambiguities.

Significant and intensive investigations about the child's theory of mind carried out in the last decade have been confined to industrialized Western cultural contexts (Wellman, 1992; Wimmer & Perner, 1983; Wellman & Bartsch, 1988; Bartsch & Wellman, 1995; Frye & Moore, 1991; Lewis & Mitchell, 1994; Astington, Olson & Harris, 1988). From Feldman's (1992) perspective, it is reasonable to assume that the nature of children's theories of mind that emerged from these studies are by-products of industrialized Western socio-cultural environments. In fact, Wellman (1992), a major contributor to this topic in the last decade, clearly suggested that belief-desire reasoning may be a product of Western, rather than non Western cultural environments. Few studies (Avis & Harris, 1991; Flavell, Zhang, Zou, Dong, & Qi, 1983; Gardner, Harris, Ohmoto, & Hamasaki, 1988) on some aspects of a child's theory of mind have been carried out in non Western cultural contexts. Avis and Harris (1991) and Wahi and Johri (1995) presented contradictory findings on a child's conception of the mind in other cultures. Avis and Harris found belief-desire reasoning in a non-literate African society, while Wahi and Johri found culture to be a significant variable in conceptions of the mind.

Beyond issues of cultural context and universality of a theory of mind, the findings of this study have significant implications for Zimbabwe, specifically its educational system. Emerging from Western- based research is the suggestion that consequences of theory of mind and/or its underlying processes have significant impact on schooling (Astington, 1993; Astington & Jenkins, 1994). Astington (1993) suggested that it appeared that the product of belief-desire reasoning, and the processes underlying its development such as representation and metarepresentation are valued and rewarded by Western oriented systems of education. Zimbabwe as a society, and its educational system in particular, has a "pervasive" Western oriented cultural legacy resulting from colonialism. The implication from Astington (1993) and Astington and Jenkins (1994) is that if belief-desire reasoning is a product of Western enculturation, rather than a universal phenomena, or a product of interaction between Western and indigenous psychologies, indigenous children with little or no Western cultural experiences may struggle to learn in these systems. This struggle may be due to lack of synchrony in expectations or modes of reasoning. For example, if indigenous cultures do not use or encourage belief-desire reasoning, when children from those environments go to school where such modes of reasoning are the dominant mode, they may lag behind their counterparts or take time to learn using that mode of reasoning. It is important for Zimbabwe to find out how such important phenomena develop in its children and how society can deal with paradoxes created by mixed folk psychologies.

Overall, the need to situate a child's understanding of the mind in cultural context, competing hypotheses, ambiguity in findings from crosscultural studies, lack of intensive cross cultural

data in general, and the relevance of the study to Zimbabwe frames the problem and justifies this crosscultural study. The nature and purpose of this investigation therefore, is to search for evidence of the existence or non existence of "belief-desire psychology" as an organizer of the child's understanding about the mind in children in a less industrialized and non-Western cultural context such as Zimbabwe. This study is different from those of Avis and Harris (1991) and Johri and Wahi (1995), in that Avis and Harris investigated the phenomena in a preliterate society largely insulated from Western culture, as well as from other subcultures of Cameroon, North Africa, and Wahi and Johri investigated a correlate of reasoning about the mind called the mental-real distinction, and not the whole belief-desire reasoning system. The broader question to be addressed by this study was whether children everywhere and anywhere construct, develop, and use a belief-desire explanatory system to reason about the mind, by searching for the evidence in eight-year-old, indigenous, schooled, and unschooled children in Zimbabwe. The questions for the study were as follows:

1.5. Research questions

1.5.1. The broader question

Is belief-desire reasoning a universal explanatory conceptual framework that is constructed, developed and used by children to reason about the mind?

1.5.2. Specific question

Do eight-year-old, indigenous, schooled, and unschooled children in Zimbabwe construct, develop, and use a belief-desire explanatory conceptual framework to reason about the mind?

1.5.3. Sub-questions:

- 1.5.3.1. What conceptual explanatory framework do eight-year-old, indigenous, schooled, and unschooled children in Zimbabwe invoke to predict and explain everyday, intentional, and overt human action?

- 1.5.3.2. How well do eight-year old, indigenous, schooled, and unschooled children in Zimbabwe perform on belief-desire reasoning tests?

- 1.5.3.3. What differences (if any), exist in performance on belief-desire reasoning tests, among different groups of children as defined by their ethnicity and school experience?

- 1.5.3.4. What is the relationship (if any), between ethnicity, school experience, and belief-desire reasoning?

If children invoke a belief-desire framework and perform well on belief-desire measures, they will be credited with the following understandings about the mind:

- 1.5.4.4.1. its representational nature;
- 1.5.4.4.2. the causal link between the mind (beliefs and desires) and one's action;
- 1.5.4.4.3. the independence between mind and external reality; and
- 1.5.4.4.4. understanding the role of representational change in understanding their own and other people's minds.

The design for this investigation reflects a post-Piagetian paradigm shift that situates children's development in cultural context. Two variables often linked to, and believed to influence, cognition and modes of thinking (Kim & Berry, 1993; Heelas & Lock, 1981; Brown, 1978; Huttenlocker, 1976; Olson, 1977), were used to create categories/groups from which to search for children's mode (s) of reasoning about the mind. These variables were the experience of schooling and ethnicity. Three investigative designs (Wellman & Bartsch, 1988 and Bartsch & Wellman, 1989 mental state attribution; Wimmer & Perner, 1983 false-belief; and Perner, Wimmer & Leekam, 1987, unexpected change), that use predicting and explaining everyday, intentional, overt human action as a medium for investigating a child's understanding of the mind were used to search for evidence of children's use of belief-desire reasoning.

1.6. Definition of terms.

- 1.6.1. Since belief-desire reasoning will be used constantly in chapters IV and V, the abbreviation B-D is used to stand for belief-desire reasoning.
- 1.6.2. In literature and research, theory of mind is interchangeably used with belief-desire reasoning, and/or folk psychology. This study uses these terms interchangeably as well.

CHAPTER II

LITERATURE REVIEW

This chapter reviews literature on a child's theory of mind carried out over the last decade. It defines the field, provides an historical context, discusses the main findings and explanations for them, and finally, gives a status report on crosscultural studies. To date, research on a child's theory of mind has focussed on describing characteristics of, and establishing norms for, understanding the mind during the preschool years. Ages three and four have received the most attention. Other issues such as the role of the environment and consequences for an advanced or poorly developed theory of mind received little or no attention; these issues remain unexplored. This literature review, reflects this imbalance.

2.1. The field of "a child's theory of mind"

To date, investigations on a child's theory of mind have been limited to knowledge, understandings, and awareness about one's own and other people's minds. Adults, it is assumed, are aware that there exists in people's "heads" something called the "mind", an unobservable entity and phenomena that underlies people's everyday, intentional, and overt actions. To live, survive, compete, and cooperate with other people in the social world, one needs a competent understanding of how one's own and other people's minds work, because the mind is linked to what individuals do and how they relate to others through their actions

(Bryne & Whiten, 1991). A theory of mind is often an indispensable "Machiavellian" tool in humans (Whiten, 1991; LaFreniere, 1988), because individuals come to learn about the mind by participating in a socially and informally constructed domain of knowledge and/or human life experience called "folk psychology" (Forguson & Astington, 1988; O'Neil & Gopnik, 1991).

2.1.1. Folk Psychology and the development of a theory of mind

Folk psychology is a set of understandings about how one's own and other minds work often characterized as a "naive" and "commonsense" way of knowing. Unlike other domains of human experience in the modern world that rely on scientific development and are developed by scientific experts, folk psychology is an "everyday commonsense understanding" of how people's minds work. It is a socially and informally constructed domain of knowledge developed over time by generations of lay members of a society (Astington & Forguson, 1988; O'Neil & Gopnik, 1991). That aspect of its development gives it an indigenous character and defines how it is learned. It derives its indigenous character from the uniqueness of the history of each generation. Over generations, each society "scripts" how the mind works and what role it plays in predicting and explaining human actions. Folk psychology is one such script.

Developed over generations, folk psychology becomes neither an everyday invention nor an individual's personal construction, but a cultural script available to members of the culture to facilitate a competent understanding of how self and other minds work. Because the

development of the script evolves through generations, it changes over time. Each generation remodels, and refines the script to reflect its own history and understanding about how minds work. The nature and development of folk psychology lends itself to an apprenticeship learning system. As children grow up in a society, they learn from more experienced members of the society and construct their theories from working alongside them. They become participants in an indigenous folk psychology. They learn about how minds work from what has been developed by generations before them and build on that knowledge for future generations.

As a script for understanding the mind, folk psychology is not only a domain of knowledge about the mind, but a cultural tool that plays multiple roles. The multiple roles of folk psychology in developing a theory of mind are summarized by Forguson and Astington (1988) as the "psychological" and "metaphysical" components. The psychological provides the language, content, and function of a mind and the metaphysical component its relationship with the external environment.

The language of the mind is mental state knowledge. Mental states are products of one's experiences stored in the mind as representations. These mental states are unobservable, private, insulated from sensory touch, and transient (Wellman & Estes, 1986; Estes, Wellman, & Woolley, 1989). According to Wellman (1992), there are two categories of mental states; those that relate to people's knowledge about the world and those about what we want from it. Knowledge based mental states are "beliefs" about the world. Mental states

of belief include states such as guessing, knowing, supposing, expecting, conviction, and doubt about the world. For example, if an individual opens a container labelled "BOOKS", the mind creates a mental state of "belief" about the location of the books. If the knowledge of the location of the book was through inference or information from other sources, rather than the individual's direct perception, the mental state will also reflect the individual's degree of conviction about the location of the book. Mental states of "desire" emerge from emotional and physiological body states such as love, hate, thirst, or hunger which in turn create mental states such as wants, hopes, wishes, likes, dislikes, and preferences. Consider an individual who tastes a wild fruit for the first time. That experience may create in the individual mental states such as desire or disgust that may direct the individual's attitude toward that fruit in future, should the individual come across it again.

In folk psychology, these two categories of mental states (belief, desire) are the language of the mind and are therefore the central constructs for talking about the mind (Wellman, 1992; 1993). Together these two mental states constitute the content of the mind. The content of the mind is the sum of mental states of belief and desire that one creates from contact with the environment. Wellman (1992) also suggested that when the mind is viewed as the sum of mental states, metaphorically, it also becomes the "container" or repository that "houses" mental states. Because of the centrality of beliefs and desires in reasoning about the mind, folk psychology is also sometimes called belief-desire psychology. Belief-desire reasoning is an explanatory conceptual framework for reasoning about the mind.

The role of the mind in understanding one's own and other people's mental life is twofold. The first is derived from the content of the mental states. For example, an individual who wants a book will be directed to its location by his mental state of "belief" (a container labeled "BOOKS") and one who desires an apple, rather than an orange will search for apples and not oranges. The second is derived from its constructivist or transformative role. Consider an individual who has just moved to a new house, who before moving knows that books were packed in several containers labelled "BOOKS". His mind will have a mental state of belief and desire for those books. If the individual wanted (desire) a particular book, the mental state of "belief" about the location of the book is processed together with the individual's mental state of "desire", to provide more accurate information about the action to take. When he wants a particular book, and has doubts about its exact location, the mind weighs both beliefs and desires to generate data for the most appropriate action to take. For example, *"since you are desperate for this book, you are better off asking for a copy from your classmate, rather than going through all those containers right now, but if you decide to do so there is also a possibility that your classmate may also be using it."* After that processing, the individual may decide to go and ask for a copy from his friend, rather than going through several boxes. The alternative could be going through the boxes, rather than relying on a classmate who may also be using the book. This nature and role of the mind is described as the "homuncular" function (Wellman, 1992). It acts as a central processor of mental states.

Wellman (1992) Wellman and Hickling (1994) said that the homuncular role of the mind is illustrated by how it is reflected in language; for example, "...his mind tricked him..", ... "the mind's eye" (Wellman, 1992: 269). Thus, adults personify the mind. In this mode, individuals personify the mind by giving it an independent role that creates an artificial separation from the individual who "carries" it. Wellman illustrated this role as follows:

.....by analogy, the mind can be viewed (in a crude but useful way) as a person in the head: a person who can be fooled leading to misinterpretations; a person who can direct and order, leading to actions; an inner person who works with ideas, crafting them, constructing them, sorting them out just as an outer person works with objects(Wellman, 1992:269).

An individual who understands the nature and function of the mind as a central processor shows a competent understanding of the nature and function of the mind. He has a powerful theory of the mind.

In summary, four aspects of the nature and function of the mind emerge from the discussion of the psychological component. First, as an entity (the sum total of mental states), second, as a container or repository that stores mental states; third as the causal link between the individual and his actions; and finally, as a processor of mental states. In combination these characteristics make up what is referred to as the mind. A child, an apprentice of folk psychology, has to discover and learn the language of mental states (unobservable, private, transient), major constructs of talk about the mind (beliefs and desires), and the nature and function of the mind as the sum total of mental states, container and/or repository, causal link to actions and processor of mental states. Those understandings help the child to understand

that A can predict the actions of B if A knows B's mental state (s) about the situation X and the active role of the mind in those states. Similarly, if A observed B's action, A can explain that action by attributing or imputing certain mental states and mental activity about the situation X to B, because of the understanding that those mental states and the mental activity behind those actions underlie B's actions.

The metaphysical component is the understanding that there is independence between the mind and the external world of reality. An individual may believe that there are books in a container labeled "BOOKS", or depend on his conviction that there were books the last time he checked, when in fact at that particular moment the container may be empty, or contain something other than books. Similarly, one's desire to have something does not necessarily guarantee its fulfillment. Thus, a mind (in Wellman's homuncular sense) may be correct about its belief about, and desires for the world, but still miss the mark. The world of the mind is different from the world of external reality. An understanding of this aspect of the mind helps one understand people's actions when they appear to thwart their desires; for example, looking for a book on the book shelf when in reality, the book is on the desk. The metaphysical component therefore not only provides information about the possible discordance between mind and action on one hand, and reality on the other, but again, tells one that people depend on their minds to carry out appropriate actions. However, an individual's mind is not necessarily a copy of the world, but a representation of it (Perner, 1991).

How children develop an understanding of both components of folk psychology is the business of the research on a child's theory of mind. To say a child has a theory of mind, is to suggest that he understands the nature and function of the mind in both the psychological and metaphysical sense. Thus, in discussing a child's theory of mind, we refer to questions about what knowledge and understandings children have about this entity called the mind. We ask what they think it is, the role it plays in predicting and explaining intentional overt action, how that knowledge emerges and develops; and what it looks like at different phases or ages, its origins, and developmental path it takes to adult-like theories (Astington & Gopnik, 1991; Bower, 1993).

2.2. Historical context of the study of a child's theory of the mind: Landmark studies

2.2.1. Piaget and the study of a child's understanding of the mind.

The study of children's understanding of the mind was initially investigated by Piaget in the twenties (Wellman, 1992; Feldman, 1992). Piaget investigated an aspect of intellectual development called childhood realism; the child's inability to distinguish between mental phenomena and real things. The understanding that mental phenomena are different from real things is an important developmental milestone. It signals an individual's capacity to develop an understanding of the mind because mental entities are products of the mind that share common characteristics with it. For example, mental phenomena are private, unobservable, and insulated from sensory touch, and so is the mind. A real book is different from an imagined one. Piaget found that preschool children tended to "physicalize" mental things.

That is, children believe that mental things existed out there in the world and could be seen, touched, and collected as other physical things.

Contrary to Piaget's findings, Wellman and Estes (1986) and Estes et al. (1989) established that by age three, children know that a real cookie can be touched and seen by other people, and that it has continued existence, while the same is not true for an imagined cookie. These findings implied that by age three, children had the capacity to deal with the nature and function of the mind. Wellman and Estes (1986), Estes et al. (1989) linked the capacity to make the mental-real distinction to the capacity to develop a theory of mind.

Although Piaget did not directly investigate the child's understanding of the mind, but rather the physical world as distinctly different from the mental world, studies on childhood realism marked the beginning of investigations about children's understanding of the mind. In the eighties, a new wave of research on a child's understanding of the mind, separate from studies on stages in intellectual development and cognitive research, but linked to them, emerged in Europe and North America. This new research not only investigated childhood realism, but other aspects of understanding the mind. It included such issues as the nature and structure of knowledge underlying a child's understanding, processes underlying or responsible for development, the norms for different ages, and developmental milestones during the preschool years that are linked to the development of a theory of mind.

Differences exist between Piaget's work and later studies not only in scope, but also in the method and context of investigation. Piaget's studies viewed the child as a "lone scientist" grappling to understand the physical world. Studies in the eighties shifted the investigation from the child's understanding of the physical world to the social world, and a child's understanding of the mind was thought to be anchored in an indigenous, socially, and informally constructed domain of knowledge. The approach was not to investigate the child's understanding of a world that existed "out there" independent of the child, but one in which he was "immersed." It situated the child in cultural context (Feldman, 1992).

Although Piaget did not specifically investigate children's theories of mind, some of the cognitive milestones he investigated such as perspective taking have been found to link with the development of theories of mind. Flavell (1988) found a relationship between theories of mind and perspective thinking. Children operating at perspective thinking level II had more developed theories of mind than perspective I thinkers. This finding appears to suggest that there may be a general cognitive skill that children rely on in construction of theories of mind and perspective thinking .

Another important developmental milestone that emerges from Piaget's earlier work is representational change. Astington and Gopnik found a link between representational change and perspective taking. Children with problems in perspective-taking have problems with representational change and false belief, important markers for powerful models of theory of mind because they ignore the mental states and thinking processes of other people. Overall

therefore, Piaget's work and contribution to the field of a child's theory of mind cannot be minimized. His work laid the foundation for the study of a child's theory of mind.

2.2.2. Premack and Woodruff: Primate studies

The re-emergence of research on a child's understanding of the mind after initial investigation by Piaget can be traced back to a study by Premack and Woodruff (1978) with primates. Premack and Woodruff (1978) initiated studies on primates' ability to infer mental states to people. Their working premise was that if a primate can impute unobservable mental states such as knowledge, purpose, intention, and belief to self and others, and use those mental states to predict and explain overt human actions, it had a "theory of mind." Premack and Woodruff found that although primates could impute intention to human beings, they had problems predicting an individual's action based on knowledge.

These findings generated the debate about the criterion for crediting one with a theory of mind. Plylyshyn (1978) and Dennet (1978) suggested that chimpanzees did not display a "rich interpretation" of the forces behind intentional overt human actions, and therefore could not be credited with a theory of mind. Recall the psychological and metaphysical aspects of the mind attributed to it in folk psychology. These aspects require the ability to represent. In testing for the presence of a theory of mind, examiners search for not only a child's ability to represent his own and other people's minds, but also to metarepresent; the ability to form secondary representations from other persons' representations. Plylyshyn suggested the following design to test the presence of theory of mind:

.....somebody who has a theory of mind does not only have a representation about a state of affairs (X) and stands in certain relationships to these representations (e.g., wanting x, believing x,, etc.), but must also represent these relationships explicitly... (Wimmer & Perner, 1983: 104).

Developmental psychologists took up the challenge and designed methods to test the presence of a theory of mind in humans rather than primates. The challenge was initially taken up by Wimmer and Perner (1983) when they designed and used a "false belief" paradigm.

2.2.3. Wimmer and Perner: Original false belief method

In 1983, Wimmer and Perner introduced the false belief method of assessing the presence of a theory of mind. In this design, a child (subject of the study) was presented with a narrative about an actor in cooperative and competitive situations. The first part required the child to predict the actor's actions under normal situations, and the second to reason about his actions in the competitive and cooperative conditions. The story was acted out using toy items. The premise was that if a child was able to predict the actions of the actor in the normal, competitive, and cooperative situations, he had a competent theory of mind. A theory of mind in this design is tested through the child's ability to reason about false belief, a mode of reasoning that requires the ability to metarepresent his and the actor's mental states. Metarepresentation involves a "rich interpretation" of one's understanding of the nature and function of the mind.

*The Narrative**Cooperative situation*

*{Scene with match boxes
fixed high on the wall}*

"Mother returns from her shopping trip. She bought chocolate for a cake. Maxi may help her put away the things. He asks: 'Where should I put the chocolate?' 'In the blue cupboard', says the mother.

'Wait I will lift you up there, because you are too small.'

Mother lifts him up.

Maxi puts the chocolate into the blue cupboard. {A toy chocolate is put into the blue match box.} Maxi remembers exactly where he put the chocolate so that he could come back and get some later. He loves chocolate. Then he leaves for the playground. {The doll is removed.} Mother starts to prepare the cake and takes the chocolate out of the blue cupboard. She grates a bit into the dough and then she does not put it back into the blue but into the green cupboard. {Toy chocolate is thereby transferred from the blue to the green match box.} Now she realizes that she forgot to buy eggs. So she goes to her neighbor for some eggs. There comes Maxi back from the playground, hungry, and he wants to get some chocolate. {Boy doll reappears.} He still remembers where he had put the chocolate."

Part I of the task

{BELIEF-question} Where will Maxi look for the chocolate?

{Subject has to indicate one of the three boxes}

Wimmer and Perner (1983:109)

Competitive situation

{Scene with cassette

containers low on the wall}

In the above scenario, to be credited with a theory of mind, the child has to display representational and metarepresentational ability. First, the child has to demonstrate how to deal with Maxi's belief that the chocolate is still in the blue cupboard because Maxi's mind formed that mental state when he put it there. Thus, he has to form a belief about Maxi's belief (metarepresentation) that the chocolate is in the blue cupboard. Second, he has to be aware of his own mental life by acknowledging new knowledge about the current location of the chocolate, which is counterfactual to Maxi's belief (which is now a wrong belief), because Maxi's mother transferred the chocolate to another location. Thus, he not only has

to form a belief about Maxi's belief, but has to simultaneously represent his belief, about Maxi's belief, and Maxi's wrong belief which is counterfactual to his own.

Cooperative situation

"OK, there he'll look, but he is too small to reach up there. There comes Grandpa and Maxi says: 'Dear Grandpa, please help me get the chocolate from the cupboard.' Grandpa asks: 'Which cupboard?'"

Competitive situation

However, before Maxi gets a chance to get at the chocolate his big brother comes into the kitchen. He, too, is looking for chocolate. He asks Maxi where the chocolate is. 'Good grief', thinks Maxi, 'now big brother wants to eat up all the chocolate. I will tell him something completely wrong so that he won't find it, for sure'"

Part II of the task (cooperative and competitive situations)

{'UTTERANCE'-question} 'Where will Maxi say the chocolate is?'

{The box indicated is opened.}

{'REALITY'-question} (asked only if the box opened is found empty)} 'Where is the chocolate really?'

{'MEMORY'-question-} 'Do you remember where Maxi put the chocolate in the beginning?'

Wimmer and Perner (1983:109)

This part of the design requires a child to display an understanding of the independence between mind and reality (metaphysical component of folk psychology) as well as the ability to metarepresent. For example, in the cooperative scenario, the child has to be aware that although Maxi wanted the chocolate, he was going to point to the wrong cupboard -an empty cupboard, because his mother had transferred the chocolate to the green cupboard. In the competitive situation, although Maxi did not want his brother to have the chocolate, he was going to unintentionally show his big brother the right box, because he did not believe that it was there.

The major finding from Wimmer and Perner (1983) was that most of four, five, and six year olds, but not three-year-olds, displayed metarepresentational capacity and also the ability to deal with counterfactual evidence. Those who displayed metarepresentational capacity were credited with a theory of mind. Three year olds said that Maxi would search in the current and new location rather than the previous location where he last saw or put it. These three-year-olds failed to predict Maxi's actions based on his false belief, because they could not represent counterfactual evidence simultaneously, or generate secondary representations (metarepresentations) of their own and Maxi's about the location of the chocolate.

The potency of this design to test all the critical aspects of a theory of mind along with the finding that four-year-olds, but not three-year-olds had a theory of mind, generated a lot of interest in the field of a child's theory of mind. A large number of studies replicated the study by Wimmer and Perner (1983) and confirmed the findings. (See Astington Harris, & Olson; Whiten & Perner, 1988; Frye & More, 1991; Cohen-Baron, Flursberg & Cohen, 1993 for reviews.) Over time, the false belief design became the "litmus test" for the presence of a theory of mind (Clements & Perner, 1994; Hogrefe & Wimmer, 1986; Wimmer & Weichbold, 1994; Dalke, 1995; Wimmer, & Hartl, 1991; Gopnik & Astington, 1988; Hongefe, Wimmer, & Perner, 1986; Perner, Leekam, & Perner, 1987; Wimmer, & Perner, 1983). Researchers using this design gradually modified it to improve its format as, for example, video presentation, play acting, involving the child in deceptive tasks, shortening the narrative, or rewording questions (Glenn, Johnson & Parry, 1993; Siegal, 1991). For example, Perner, Leekam, and Wimmer (1987) used the same parameters to develop the

"unexpected change task". In the unexpected change task, a child is presented with a familiar confectionery box, e.g., SMARTIES for the UK, and M&Ms for the US. A child is asked to predict the contents of the box. After the prediction the examiner shows the child the unexpected and real contents of the box at that time, e.g. crayons. The child is further asked what he originally thought was in the box before the real contents of the box were shown to him. Finally, the child is asked to predict what another person with no knowledge of the current contents would think was in the box. The design of predicting from false belief and testing the child's metarepresentational ability remained the same. Only the content of the task was changed.

The second design to test the presence of a theory of mind in young children came from Wellman and Bartsch (1988) and Bartsch and Wellman (1989) who developed a method that differs from Wimmer & Perner in both design and findings.

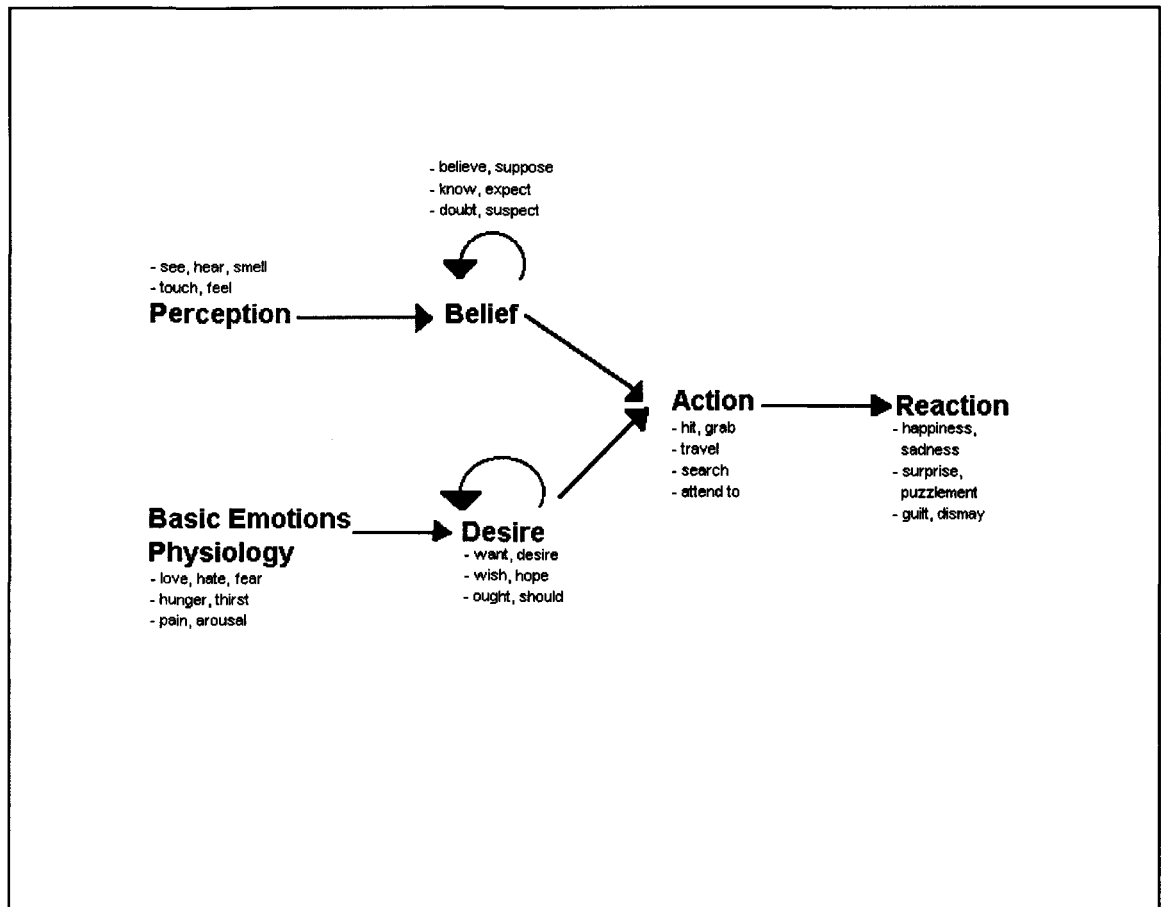
2.2.4. Wellman and Bartsch : Mental state attribution method.

Wimmer and Perner (1983) did not present a theoretical framework for children's reasoning about the mind, but tested for the presence of a theory of mind within the broader theory-theory framework. Wellman and Bartsch (1988) and Bartsch and Wellman (1989), Wellman and Bartsch (1988) began from a specific theoretical framework. They placed the child's theory of mind within an adult folk belief-desire reasoning theoretical framework. Their premise was that children understand the mind through belief-desire reasoning. This explanatory framework is a mode of reasoning and an organizer of all issues relating to the

child's understanding of the mind. Wellman and Bartsch hypothesized that children's reasoning about the mind operated within a "belief-desire" framework of adult folk psychology. Since adult folk psychology is a mode of reasoning about the mind, the presence of a theory of mind could be tested and measured against how competently a child uses that system. Wellman (1992) represents this framework as follows:

2.2.4.1. *Belief-desire framework of adult folk psychology*

Scheme for depicting belief-desire reasoning: Source: Wellman (1992:100)



Simplified scheme for depicting belief-desire reasoning. A version of this scheme was first presented in Wellman and Bartsch (1988) .

A competent user of this system understands that reasoning about people's actions is driven by beliefs and desires and that there are significant differences between them. First, beliefs emerge from perceptual experience, while desires come from physiological and emotional states. Second, people's actions are dependent on their mental states which are the causal link between the individual and his actions. Third, actions taken on the basis of beliefs and desires cause emotional reactions, which are different for beliefs and desires. Belief based reactions cause puzzlement, surprise, or expectancy, where as desire based outcomes result in sadness, happiness, guilt, dismay, or disappointment. For example, if an individual wanted a book and believed that the book was in the kitchen, he would go to the kitchen because of the belief and conviction about its location. If he does not find the book he gets surprised or puzzled because of the previous conviction that it was there. Because his wish (desire) was not fulfilled, he gets disappointed or sad.

Bartsch and Wellman (1989) and Wellman and Bartsch (1988), suggested that two types of reasoning constitute a belief-desire reasoning system. The first type is forward reasoning, and the second, backward. In forward reasoning, an individual has the ability to predict actions and emotional reactions given the other person's beliefs and desires. In backward reasoning, an individual displays the ability to explain an observed behavior by imputing relevant beliefs and desires to the person. From this theoretical framework, Wellman and his colleagues designed a mental states attribution method based on the adult belief-desire reasoning framework.

2.2.4.2. The mental state attribution method

Two types of tests represented the two types of reasoning. Each battery of tests had built in tasks to control for and rule out alternative reasoning strategies. For example the 'not-own-belief' task rules out simulation strategies. This implies that children do not operate from a theoretical conceptual framework but that when they are faced with a problem requiring them to predict other people's actions, they imagine what the other person would do. The not-own-belief task places a child in a position where their own belief is different from the actor's, thus controlling for simulation strategies (reference to mental states attribution) thinking. These tasks were necessary to control for non representational and mentalistic thinking. Non mentalistic non-representational thinking is when a child refers to activities outside an individual's internal mental states such as beliefs and desires to predict or justify his actions. For example in 2.4.2.2 below, a non mentalistic thinker may say that Jane is looking for her kitten under the piano because it prefers to rest there, rather than that because Jane believes that it might be under the piano. One of the reasons why children were not credited with a theory of mind in the false-belief task was that three year olds reflected non mentalistic non representational thinking (Perner, 1989; 1991). The full battery of the two types of reasoning are in Appendix I. For the purposes of this discussion two examples are given and discussed below:

Forward reasoning

Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is under the porch. Where will Sam look for his puppy ? (Garage or porch?).

To be credited with a theory of mind, the child had to reason that, since Sam wants to find his puppy and he thinks that it is under the porch, he will search under the porch. The child had to attribute a mental state of belief (thinks it's under the porch) and desire (wants to find his puppy) to Sam, in order to predict his actions.

Backward reasoning

Here is Jane. Jane is looking for her kitten under the piano. Why do you think Jane is doing that?

To be credited with a theory of mind the child had to impute mental states of belief (she is looking under the piano, she must think it's there) and desire (she is looking for it because she wants to find it) to Jane to explain her actions.

Both forward and backward reasoning included a justification component. Children had to justify their predictions and explanations. This component gave the child the opportunity to evoke belief-desire or other alternative reasoning systems. The key for both kinds of reasoning is the ability to impute and/or attribute mental states to another person and use those states to predict or explain his actions. Using this method, three categories of findings emerged. First, was the emergence of a coherently organized reasoning system similar to adult folk psychology; second, was children's knowledge about and use of the major constructs of beliefs, desires; and third, since the study by Wimmer and Perner (1983), for the first time, three year olds were credited with a theory of mind.

2.2.4.3. *Invoking a belief-desire reasoning system: Children's reasoning about beliefs and desires.*

Through the mental state attribution method, Wellman and Bartsch carried out several studies that showed that children invoked a belief-desire reasoning system to predict and justify an individual's actions. Wellman (1988); Wellman and Woolley (1989), Bartsch and Wellman (1989) and Wellman, and Bartsch (1988) asked children to predict and justify character's actions using the instrument in Appendix I discussed above. They found that a coherent, systematically organized body of knowledge in the form of stages or phases reflecting modes of thinking within the belief-desire reasoning systems emerged. Later, other studies replicated these findings (Wellman & Bernajee, 1991. Wellman and Woolley, 1990, Wellman, 1993; Wellman & Bartsch, 1994). Each stage showed a coherently organized body of knowledge reflecting qualitatively different ways of reasoning about beliefs and desires and different modes of reasoning about the mind. This system was demonstrated by how children used beliefs and desires and how they invoked them to justify their responses. Children's use of beliefs and desires and the various modes of reasoning that seemed to emerge were organized by and around the following stages of development: simple desire, desire-belief, and lastly, belief-desire.

Simple desire

The first stage of belief-desire reasoning is "simple desire psychology." It is often a preferred mode of reasoning for two-year-olds. Their reasoning reflects a predominance of desires. Thus, instead of acknowledging and recognizing the role of both beliefs and desires

in predicting and explaining people's actions, two year olds ignore beliefs and only take account of a person's desires. This mode of reasoning is influenced by a two-year old's belief that people always take actions that fulfill their desires (Wellman, 1992). Two year olds use and rely on this mode of reasoning, but with limited success. It does not account for all phenomena about the mind (Wellman & Woolley 1989; Wellman, 1991;1992). As they gain experience in using folk psychology, they discover that desires fail to explain many intentional overt human actions. For example, why would Maxi take an action that thwarts his desire (showing the big brother where the chocolate really is, or grandpa an empty cupboard), by searching for an item he wants in the wrong place rather than where it really is? The failure of simple desire to account for some phenomena leads two-year-olds to occasionally consider beliefs. Occasional reference to beliefs gradually develops them into desire-belief psychology.

Desire-belief psychology

Desire-belief reasoning means that although the child is predominantly influenced by desires, he occasionally makes reference to beliefs, especially when the simple desire system breaks down as, for example, inability to understand why Maxi would show his big brother where the chocolate is, rather than the empty cupboard. Because the mode of thinking is desire driven, the two-year-old reasoned that Maxi should show his grandfather where the chocolate really is because if he showed him the other place, it would no longer be there. Like wise when Maxi shows his brother where the chocolate really is, in two-year-olds' eyes that action seems to thwart Maxi's desire to have the chocolate. Belief, in either case is disregarded

because at this stage the mode of reasoning is desire driven. Older twos and some younger threes appear to rely on this mode of reasoning (Wellman & Bartsch, 1988; Bartsch & Wellman, 1989; Wellman, 1988, 1991). At the end of this period the child gradually realizes the centrality of beliefs and the necessity of considering mental states of desire and belief equally in order to generate reliable data for successfully predicting and explaining intentional overt human action. This realization leads the child into the belief-desire reasoning phase.

Belief-desire reasoning

According to Wellman and Bartsch belief-desire reasoning is used by children from three years to adulthood. This kind of reasoning considers beliefs and desires and understands the distinctions between them, including their relative functions in reasoning about intentional overt human action. However, three year olds are only beginning to understand this reasoning framework. Their understanding of the system continues to grow throughout childhood as they gradually acquire the basic understanding that people's actions are dependent on their beliefs and desires, and if one is to understand those actions, one has to understand the mental life and activity behind those actions.

In each of these stages Wellman and his colleagues suggested that children reflect qualitatively different conceptions, understandings, and modes of reasoning about the nature and function of the mind, and that later stages are more powerful and inclusive than earlier ones. This finding was the first evidence from research that a child's reasoning about the

mind may be theory-like. The findings by Wellman and his colleagues that three year olds had a theory of mind sparked controversy about the age at which a theory of mind emerges. Their work contrasted with Wimmer's and Perner's (1983) and subsequent studies that found that three-year-olds did not possess a theory of mind. The major sticking point was whether the three year olds in Wellman's studies had the ability to impute beliefs and desires, a characteristic consistent with the capacity to represent and metarepresent. Recall that representational and metarepresentational capacity, the ability to impute beliefs and desires to self and others, is a major criterion for crediting one with a theory of mind.

Disagreements between Perner and Wellman and Bartsch.

Perner (1988, 1989 1991) disputed the evidence from Wellman and his colleagues. He suggested that children from Wellman and his colleagues were using alternative non-representational strategies. Recall again that in the false belief method children who succeeded at the task were credited with a theory of mind because of their ability to demonstrate mentalistic representational and metarepresentational thinking. Perner asserted that three year olds in Wellman's studies were not necessarily reasoning about beliefs in a mentalistic and representational fashion; rather, they were reasoning as "situational theorists." According to Perner (1991), a situational theorist arrives at the same answers as Wellman and Bartsch's three-year olds by matching the individual's belief or substituting mentalistic terms such as "thinking of" in referring to the actor's preference. For example, a statement such as .."Jane thinks that the cat is under the piano is understood as ..Jane prefers to look under the piano." Children using both types of understandings may correctly

predict Jane's actions, although the latter's prediction is based on a misconception. When matching is the strategy, the child need not invoke mentalistic thinking, representational and metarepresentational thinking. Wellman and Bartsch (1989) discounted Perner's proposition by arguing that their designs included more than one task to control for strategies that Perner was referring to. (See Appendix I for example of a series of tasks in the design). Data from the control tasks did not show situation theorist reasoning, but mentalistic representational thinking, Wellman argues.

Linked to this controversy was why three-year-olds, including those in Wellman's studies, consistently failed false belief tasks despite attempts to simplify them. In the mental state attribution design, although three-year-olds could not predict (forward reasoning) from false belief, they could explain action based on false belief (backward reasoning). I believe that on one hand, this result appeared to support Perner's argument that three-year-olds did not possess a theory of mind. Recall that in Wellman's adult belief-reasoning scheme, a child who possessed a competent belief-desire reasoning system was one who was able to carry out both forward and backward reasoning. In this case, they passed tests for backward and forward reasoning using beliefs and desires, but failed forward reasoning when it involved false belief. On the other hand, these three-year-olds were able to demonstrate an understanding of the two major constructs of the reasoning system. It is not clear yet whether false belief is a separate or a major construct in the belief-desire reasoning system, or a process underlying its development. Thus, failing forward reasoning from false belief may not be a clear criterion for not crediting a child with a theory of mind when he can carry out

the two major types of reasoning using the two major constructs within the belief-desire reasoning framework, including backward reasoning of false belief.

Wellman (1992) appeared to provide a reasonable explanation for the discrepancy in these findings. Wellman agreed with the false belief design proponents that three year olds consistently failed to predict from false belief despite improvements in the medium of presentation (Wimmer & Hartl, 1991; Gopnik & Astington, 1988; Hongrefe et. al., 1986; Perner et al, 1987; Wimmer, & Perner, 1983; Sullivan, & Winner, 1991; Clements & Perner, 1994; Wimmer & Weichbold, 1994; Dalke, 1995; Wimmer, & Hartl, 1991; Hala, Chandler, & Fritz, 1991). However, what Wellman (1992) disputed was the conclusion that failure to predict from false belief alone was evidence that three-year-olds did not possess a theory of mind. For Wellman, three-year-olds' failure was not a reflection of their non possession of a theory of mind. Rather, it could be an indication that "false belief" may be another construct or underlying process responsible for other aspects of the belief-desire reasoning scheme that children will need to acquire during their childhood years.

Wellman and his colleagues get support from evidence that children younger than three possess representational and metarepresentational skills (Lillard, 1994; Leslie, 1987 (a), (b); 1988). The evidence is reflected in language and pretend play. If children did not have metarepresentational skills by age four as Perner suggested, how else could younger children engage in pretend play or develop a language? On the other hand, it is possible that Perner was not referring to general metarepresentational capacity, but to one specific to

understanding the mind. If so, then Wellman and his colleagues' explanation is even more plausible because they suggested that false belief could be a specific construct or skill within the belief-desire reasoning system that children may master later; its lack did not necessarily disqualify them from being credited with a theory of mind. Children's development of an understanding of the mind continues through childhood.

Finally, it is important to note that there is also the possibility that these disagreements resulted from using different designs, that had different criterion for crediting one with a theory of mind. For Wimmer and Perner (1983), the criterion was metarepresentation. For Wellman and his colleagues it was mental state attribution, which subsumed representational and metarepresentational capacities. Thus, Wimmer and Perner appeared to have focussed on underlying processes for a theory of mind, while Wellman and his colleagues searched for the content or underlying knowledge. These differences do not necessarily make either wrong, but may be a reflection of different lenses used to examine the same problem.

2.2.5. Chandler, Hala and Fritz: The Deception method

Wellman and his colleagues were not the only group that disputed the conclusions of the false belief method. Chandler et. al. (1986) suggested that the false belief design underestimated children's competencies. It was not context sensitive in both task and in children's involvement. They reasoned that if the task was more realistic and concrete, and children were personally involved in it, rather than participating as observers, they would

display a theory of mind. They designed and used a "deceptive method" to test for the presence of a theory of mind.

The deceptive method involved a child's invitation to prevent a competitor from retrieving a hidden item by deception. A child was presented with three containers in which to hide an item. In addition, he was given a toy puppet to help him hide from a competitor. The puppet left footprints along the path to the hidden item. The child and the puppet could either hide the item and wipe off the tracks, or wipe off the clues to the correct container and lay them out to the wrong one.

Deception, they argued, was a reliable and valid test for the presence of a theory of mind because it tapped skills similar to those required by the standard false-belief paradigm but in a different and more context-sensitive manner. For example, in order for A to deceive B, A has to intentionally misinform B by manipulating B's mental state (mentalistic and representational thinking). This behavior reflects A's awareness that supplying misleading information will change B's previous representation, consequently resulting in a behavioral action different from the one that would occur if B was acting on correct information and/or previous mental states. The deceiver targets mental states because of the realization that those representations are the causal link to overt action. A has to deal with counterfactual evidence, i.e. what A wants/desires the other to believe, and B's current mental state. Furthermore, A has to form a belief about B's new belief (metarepresentation) once wrong information is supplied. In this paradigm, if a child was able to deceive another by either

wiping away or laying out false trails to deny a competitor access to the hidden item, he was credited with a theory of mind.

Using this design, Chandler et al. (1986) found that children as young as two-and-half-years-old demonstrated the ability to strategically misinform others by laying out false trails and removing clues. Hala et al. (1989) replicated these findings. Contrary to earlier findings that four year olds, but not younger children, had a theory of mind, in these studies, children younger than three were credited with a theory of mind. These findings lowered the age still further than in Wellman's studies, to two and a half.

These results again spurred controversy regarding the ages at which a theory of mind emerged. The proponents of the false belief method refuted these findings (Perner, 1991; Sodian, Taylor, Harris, & Perner 1991). They (Perner 1991; Sodian, Taylor, Harris, & Perner, 1991) charged that the analysis and conclusions from the Chandler et. al. (1986) and Hala et al. (1989) studies were flawed. Their own studies suggested that although two and three year olds laid out or wiped away trails, they did not realize the consequences of those actions on their opponents' mental states. Two year olds did not make reference to changing the other person's mental states as the purpose of wiping trails. That realization was a critical understanding of the nature of the mind because it showed an individual's mentalistic thinking (reference to mental states), understanding the causal link between mental states and actions, as well as the representational nature of the mind. Four year olds were more aware of the impact and consequences of their actions (changing mental states to affect behavior)

than three year olds. Their results, Sodian et al (1991) suggested, provided further evidence that an understanding of false belief and deception emerged at around four years of age.

The challenge to Chandler et al. (1986) and Hala et al. (1991) was not so much to their methodology, because even in Wimmer and Perner (1983) the competitive situation in the false belief paradigm had used deception as a method for testing the presence of a theory of mind. Rather, it was the finding and conclusions that children as young as two and half years had a theory of mind that created skepticism. Other researchers agreed with the premise of the deceptive method to test the presence of a theory of mind, but failed to replicate the finding of Chandler and his colleagues (Sodian, 1991; Sodian, 1994). Consequently few researchers used this method and the findings were and have been largely ignored.

2.3. Explanations for the development of a child's theory of mind.

The number of studies searching for the presence of a theory of mind in preschool children increased after the work of Wimmer and Perner (1983), Bartsch and Wellman (1988) and Wellman and Bartsch (1989). A consistent pattern of findings emerged from these studies: There were differences in performance and/or theories of mind between three and four year olds. Four year olds, but not three-year-olds, were credited with a theory of mind. Even according to Bartsch and Wellman (1988) and Chandler et al.(1989), who credited three-year and two-and-half year olds with a theory of mind, four-year-olds still out-performed three-year-olds who in turn out performed two-and-half-year-olds. There were significant age differences between groups of children. The performance showed age trends with older children out-performing younger ones. In addition, it was also clear that the period between

three and five years was a "watershed" for the development and/or emergence of a theory of mind. These results requires some explanation.

Three categories of explanations emerge from research. The first relates to global, conceptual, and theoretical explanations about the origins and development of a theory of mind. The second emerges from research findings specifically focussing on explaining differences in performance or understanding of the mind between age groups, and the third from design issues. The research focus on explaining the differences between three and four year olds' understanding is not surprising since most of the controversy and differences in performance has surrounded that age group.

2.3.1. Theoretical conceptual explanations about a child's theory of mind.

Theoretical explanations about a child's theory of mind are diverse and include theory-theory, innate predisposition, enculturation, simulation, and information processing (Astington & Gopnik, 1991; Bower, 1993; Perner, 1991; Wellman, 1992). These explanations do not necessarily explain the data emerging from research, but rather the theoretical perspectives in conceptualizing child's understanding of the mind. The theory-theory is the only conceptual perspective that has provided consistent evidence about the differences in understanding between age groups.

Theory-theory

The theory-theory view suggests that throughout childhood, children construct a theory-like body of knowledge for accounting for a variety of phenomena about the mind. Belief-desire reasoning is believed to be one such body. This theory-like knowledge is not similar to scientific theories formulated and used by scientists, but is a commonsense understanding of how the mind works and what role it plays in predicting and explaining everyday, intentional overt human action. To the extent that the development of a child's theory of mind is a gradual construction of a theoretical, coherent and integrated body of knowledge from which principles, laws, and generalizations about predicting and explaining one's own and others' actions can be drawn and used, it is referred to as a theory (Astington & Gopnik 1988; Bower, 1993. Wellman, 1992, Wellman & Woolley, 1989).

The theory-theory perspective provides the most comprehensive evidence for theory construction by children (Lewis & Mitchell, 1994; Frye & Moore, 1991; Astington et al, 1988; Wellman, 1992). From this perspective, children's theories about the mind can be discerned at various stages of development. Each phase of development (simple desire, desire-belief, belief-desire) reflects a unique and qualitatively different mode of reasoning about the two major constructs of belief-desire reasoning. With experience the child constructs a more powerful model to account for a variety of phenomena about the mind in this case belief-desire reasoning (Wellman, 1992; Perner, 1991; Astington & Gopnik, 1988; Bower, 1993; Astington, 1993; Astington et al.1988). The suggestion here is that a theory

of mind is not innate, but is constructed by the child from experience and interactions with others (Wellman, 1992; Perner, 1991; Astington & Gopnik, 1988; Bower, 1993).

Other explanations about theory construction comes from Astington (1993). Astington identifies and describes three levels of reasoning about the mind. The levels Astington proposes are modes of reasoning that also reflect the child's sequential development in understanding the mind and the construction of a system for reasoning about the mind, each qualitatively different from the other.

The lowest or zero level is a mode of reasoning without the ability to attribute, infer and impute mental states to self and others. As indicated earlier from studies by Wellman (1990), Plylyshyn, (1978) and Premack and Woodruff (1978), one marker for the presence of a theory of mind is the ability to impute or attribute mental states to self and other people. Research with autistic children (Happe' 1994; Baron-Cohen, Leslie, & Frith, 1985; Baron-Cohen et. al., 1993) suggested that autistic children operate at this level. There is the suggestion that the majority of these children have special difficulties with mental state knowledge. They fail to attribute or impute mental states to self and others resulting in an inability to be aware of their own and other people's minds. The autistic child's failure to "read" people's actions is attributed to a lack of theory of mind, a phenomena dependent on an understanding of mental states. Recall that mental states is the "language" of the mind and if an individual has problems understanding mental states, the capacity to develop a theory of mind is severely constrained.

The next or first order level considers beliefs and desires in predicting and explaining intentional overt human actions. A child operating at this level is aware that individuals act on the basis of their beliefs and desires, and that predicting or explaining overt actions requires imputing beliefs and desires. I believe Wellman and his colleagues tested this level of reasoning. The second order level focusses on understanding how an individual targets other people's thinking to affect what they will do. This level of thinking appears to be the same level of thinking tested for by the false belief and the deception methods which used its presence as evidence of a theory of mind. Recall the differences between Wellman and Perner on their findings. If Astington's levels of thinking are layered over the argument, at some level, it appears as if they were testing different levels of thinking. Wellman and his colleagues may have credited three year olds with a theory of mind on the basis of Astington's first order level. From Astington's position, children performing at this level can be credited with a theory of mind. Perner and Wimmer (1983) on the other hand, appear to have tested second order level thinking which is probably the reason it was more evident in three and four year olds. It is a higher level of understanding of the mind.

Because of the developmental approach in this tradition, explanations about the differences between age groups take a deficit approach. Three year olds are viewed as operating at lower levels or modes of thinking, while four year olds are credited with more powerful and higher level modes. Three year olds are not viewed as having precursors to a theory of mind, but as possessing no theory of mind, because of some conceptual deficits such as lack of metarepresentation (Astington & Gopnik, 1991).

Innate predisposition

The main focus of the innate predisposition is explaining the origins of the human's capacity to understand their own and other people's minds. Three views exist within this perspective. First is the view that maturation is responsible for the development of an understanding of the mind. A child's emerging understanding of the mind is therefore viewed as a by-product of a maturing brain that manipulates information in increasingly complex ways. The more mature the brain, the more efficient it is in handling and accounting for data about the nature and function of the mind. The second view is that human beings are born with a Theory of Mind Module (ToMM) which is responsible for the development of a theory of mind (Leslie, Baron-Cohen, & Frith, 1985; Bower, 1993). The suggestion here is that in the human brain, there is an area responsible for processing information about mental states that allows every child to theorize about the mind. The implication therefore, is that, if the ToMM is damaged, as it is in autism, deficits in understanding the nature of mental life are created. The third view is a philosophic one, but one that has significant impact and implications for developmental psychology. Fodor (1987) argued that all human beings irrespective of where they live, are born with the capacity to reason in belief-desire terms and/or develop a theory of mind.

This latter position supports the theory-theory data of evidence of a belief-desire reasoning system in adults and children. Although studies have not been carried out, its contribution to explanations about the origins of the capacity to understand the mind and inferences about differences between children appear to lie in evolving maturation in normal children, and

interrupted development in atypical children as those with autism. Thus, although there are differences in conceptualization between the innate predisposition and theory-theory perspectives, the explanations for differences in performance between age groups are similar in some respects.

The Enculturation hypothesis

The "enculturation hypothesis" is in direct contrast to the idea of innate predisposition. It is popular with anthropologists as its the major focus is the context and process of development. The major suggestion from this perspective is that modes of thinking including reasoning about the mind are a construction of the cultural environment. From this perspective therefore, each culture and/or environment defines the content, processes, tools, and priorities for understanding the mind, essentially creating diverse, rather than unitary routes and outcomes (Heelas & Lock, 1981; Kim & Berry, 1993). Recall that folk psychology is an indigenous script for reasoning about the mind. From this perspective, assumptions of the universality of a belief-desire reasoning system such as those expressed by Fodor and Sterelny, must include evidence from the cultural context and/or its indigenous psychologies. For example, findings on a child's theory of mind that emerged from Western based research cannot be generalized to other cultural contexts because folk psychologies or scripts about the mind may be different. The argument is that Western cultures encourage different types of reasoning systems from non-Western cultures. In fact, Wellman (1992), a major contributor to the knowledge about the development of belief-desire reasoning, appeared to support this view. He speculated that belief-desire reasoning may be a product

of Western, rather than non Western cultural environments. Wellman (1992) suggested that a belief-desire reasoning framework is tied to one's "self agency," and self agency is a product of Western, rather than non Western cultural environments.

The implication and suggestion from the enculturation hypothesis, therefore, is that a mode of reasoning such as belief-desire is a product of an indigenous folk psychology, and thus caution needs to be exercised in asserting its universality. Diversity in cultures limits its generalization. This position appears to be reasonable if one considers that folk psychology is an indigenous and socially constructed domain of knowledge that is crafted and scripted by societies to learn how the mind works. To posit a universal theory of mind is to suggest a universal folk psychology. Such a proposition is open to question.

The simulation and information processing theories.

These last two theoretical explanations, the simulation and information processing theories, are less comprehensive than those first described. These two explanations emerged as critiques of the theory-theory suggestion that children's knowledge about the mind is theory-like. The simulation theory argues that children do not construct a theoretical explanatory framework at all, and that they need not do so. Their understanding of their own and other people's mental life is through introspection and projection of their own experiences onto other people (Johnson, 1988; Harris, 1988). For example when a child is asked to explain an individual's observed action, a child may say "... how would I act in that situation?" instead of "...people act on the basis of their beliefs and desires about certain events." The former

mode of thinking about the cause behind people's actions is a simulation strategy while the latter is based on invoking a general theoretical framework about why people do the things they do.

The information processing theory also opposes the theory-theory suggestion that children's growth in their theory of mind is not due to the gradual construction of a more comprehensive and competent explanatory framework such as belief-desire. Rather, information processors regard theory of mind as an elaboration of the existing larger general cognitive capacities such as memory, language, and thought. Thus, as children develop more efficient cognitive capacities to deal with information about mental life, they become more efficient in reasoning about the mind as well.

The "theory-theory" perspective is represented in the largest body of research evidence about a child's understanding of the mind produced in the last decade. This perspective provided a conceptual framework for studying a child's theory of mind, explained and supplied evidence on the origins of a theory of mind, identified important constructs and markers for a competent theory of mind, and mapped out paths of development (Astington & Gopnik, 1988; Bower, 1993; Lewis & Mitchell, 1994; Frye & Moore, 1991). All these aspects of the mind are organized by an explanatory conceptual and/or reasoning system called belief-desire. The other conceptual frameworks have either remained largely theoretical and speculative, and/or have attempted to challenge the evidence produced by the theory-theory.

2.3.2. Explanations from research evidence: The second generation of studies on a child's theory of mind.

It is important to note from the outset that the studies to be reviewed in this section used the theory-theory perspective as their conceptual framework. These are "second generation" studies that followed the initial studies which found differences in performance between age groups. Two categories of studies attempting to explain differences between three and four year olds emerged from this research. The first category explains children's problems in conceptualizing the mind as emerging from poor theories of knowledge (Astington & Gopnik, 1988; Robinson, 1994; Wimmer, Perner, & Hogrefe, 1988; O'Neil & Gopnik, 1991; Keenan, Ruffman, & Olson, 1994; Ruffman, & Olson, 1989; Sodian & Wimmer, 1987; Hogrefe, Wimmer, & Perner, 1986) and underlying developmental processes which either foster or hamper their understanding (Perner, 1991; Taylor 1988; Perner & Ogden, 1988; Gopnik, Slaughter et al, 1994; Beal, 1994; Wimmer et al, 1988; Yaniv & Shatz, 1988; Gopnik & Graf, 1988; Wellman & Bartsch, 1988). The second group of studies also touch on issues of design and/or methodology (Wimmer & Perner, 1983; Wellman, & Bartsch, 1988; Perner, 1988; Chandler et al, 1989; Hala et. al., 1991; Clements & Perner, 1994; Siegal, & Beattie; 1991; Dalke, 1995; Glenn et al, 1993; Sodian et al, 1991).

Children's theories of knowledge

Differences in theories of knowledge between older and younger children appear to be the single and most significant explanation for differences in conceptualization of the mind. Children younger than four years have problems understanding and utilizing sources of

knowledge, making causal links between perception and belief, distinctions between seeing and knowing, mind and action, and representational change.

Children's understanding and utilization of sources of knowledge.

One set of studies on children's theories of knowledge are those dealing with children's understanding and utilization of sources and/or origins of knowledge (Pillow, 1989; Pratt & Bryant, 1990; Sodian & Schneider, 1990; Sodian & Wimmer 1987; O'Neil and Gopnik, 1991; Taylor, 1988; Ruffman & Olson, 1989; O'Neil et al, 1992). Sodian & Wimmer (1987) Pillow (1989) and Perner et al. (1987) found that four, but not three-year-olds, understood that a person's knowledge or belief about something is not only contingent on that person's perceptual access to knowledge, but also on other sources such as inference. Three-year-olds fail to attribute and/or credit knowledge to individuals who acquire it through means other than direct perceptual access. The result is that children miss valuable information coming from other sources. For example, they distrust information that comes through other people. To the extent that the child mistrusts sources of information other than direct perception, his theory of mind is limited.

Although children trust perception as the most reliable source of information, they only trust it when it applies to them and not to others (Pratt & Bryant, 1991; Taylor, 1988). An input that comes through other minds, although not totally disregarded, is considered as potentially unreliable. For example, in studies by Robinson (1994) Perner et al. (1987) and Perner and Wimmer (1988) using the unexpected change design, children chose to remain with their

own previous belief, which was inferred from the picture of the box, rather than relying on new second hand knowledge. That is, children gave greater weight to what they themselves experienced rather than what they were told by other people. Failure to credit others with knowledge even when those other individuals have had access to information, results in wrong mental state attributions and consequently in poor prediction and explanation of the individual's actions. Furthermore, failure to acknowledge the impact of new information on one's mental representations, such as in the unexpected change task, leads to faulty predictions and also shows limited awareness of one's own mental life and consequently, a poor theory of mind.

Younger children do not only neglect information that comes through other minds or from sources other than direct perception (O'Neil & Gopnik 1991), but also have problems identifying the sources of their own beliefs. O'Neil and Gopnik found that three-year-olds could not distinguish knowledge that they acquired through the various senses. They concluded that failure to distinguish sources of information placed limitations on a child's ability to recognize changes in his own mental states. In addition, not knowing which information came from what sources also places limitations on a child's ability to assess the accuracy and trustworthiness of information. If one relies on untrustworthy information, neglects reliable sources of information, treats with equal trustworthiness or suspicion information from different sources, the result is false impressions and inaccuracy in predicting and explaining overt action (Nisbert & Ross 1980). The differences between

children of different ages in understanding the mind therefore, may be due to differences in proficiency in utilizing sources of knowledge.

Inability to make causal links between perception and belief, and distinctions between seeing and knowing.

The inability to make causal links between perception (all senses) and mental states is the fourth problem associated with deficient theories of knowledge. To Wimmer et. al. (1988), it appeared that children younger than four had problems making causal links between informational sources (Robinson, 1994; Sodian & Wimmer, 1987; Sodian & Schneider, 1990; Wimmer, Hogrefe & Sodian, 1988; Pillow, 1989; Keenan, Ruffman, & Olson, 1994; Hogrefe, Wimmer & Perner, 1986) and resulting knowledge (Gopnik, et. al., 1994; Yaniv & Shatz, 1988; Taylor 1988 (a), (b); Gopnik et al 1994; Taylor, 1988 (a), (b)). Yaniv et al.(1994) also found that a related problem was one of perception. Children had problems making distinctions and links between seeing and knowing. Recall that in the Wellman and Bartsch (1988) and Wellman (1992) belief-desire reasoning scheme, perception is the source of beliefs, and belief is a major construct in the framework for reasoning about the mind. When a child cannot make these links, and fails to make distinctions between them, he fails to acknowledge or credit knowledge to self and others, resulting in poor predictions and explanations.

Representational change

Another explanation for differences in understanding between age groups is understanding of the concept of "representational change" (Gopnik & Astington, 1988; Gopnik & Graf,

1988; O'Neil & Gopnik, 1991; Ruffman & Olson, 1989). Representational change is defined as the ability to acknowledge changes (or stability) in one's own and other people's mental states. For example, in Maxi's false belief story, the child needs to realize a lack of representational change in Maxi's mental state between the time he saw the chocolate and the time he came back to look for it. At the same time, he should also recognize representational change that took place in his own mental state because of his knowledge about the new location of the chocolate. Perner et. al. (1987) found that children younger than four failed to recognize and acknowledge changes in their own mental states even after they had been shown the contents of the package. Three year olds insisted that they had always thought that the package contained the current contents even after being reminded of their initial response to the question. In some cases, they chose to remain with their original belief despite new information that the box had crayons and not M& M's. Four-year-olds on the other hand, did not appear to have this problem. They acknowledged representational change when new information was made available. Children who failed to recognize and utilize representational change made faulty predictions.

Causal links between the mind as an entity and the individual's action

The fifth problem is the inability to make causal links between the mind as an entity and an individual's action. This problem is tied to changes in the child's theory of mind between ages three and five years. This explanation relates to broader conceptual deficits in three-year-olds and qualitative changes in theory of mind in older three-four-and five-year-olds (Perner, 1991; Wellman, 1992). For Wellman (1992), and Wellman and Hickling (1994), it

is a child's inability to understand the mind in a homuncular function. This is the awareness that a mind is not only a container or repository of information/ mental states, but also a processor of that information, and that as an entity it is linked to actions. The ability to understand the mind as an information processor Wellman (1992) suggested is a dramatic, major conceptual theory change, and a developmental milestone towards a competent theory of mind.

A similar explanation, but from a different perspective also comes from Perner (1991, 1990) and Wimmer, Perner and Davis (1990). Perner and his colleague suggested that children fail to make causal links between the mind and action because of their inability to understand the representational nature of the mind. Children younger than four fail to understand that the mind is not a copy of the world, but only a representation of it. The representational nature of the mind may be linked to the metaphysical component of folk psychology, the understanding that there is independence between the mind and the world (Astington & Forguson, 1988; Perner, 1991; Wellman, 1992). Thus, despite what the world looks like at a particular time, an individual will act on what is represented in his mind and not what the true and current situation is. Three-year- olds or younger children who act a "situational theorists" totally ignore mental states because they match the desire to have an item and its location without acknowledging change in others' mental state or representation. Recall that according to Perner (1991), situational theorists ignore mental states, yet mental states are the "language" of the mind. This leads to poor predictions and explanations, and consequently reflects a poorly developed theory of mind. A child's understanding of the

representational nature of the mind is measured by the false belief method. That understanding is anchored in representational and metarepresentational ability.

The problems outlined and discussed above result in different theories of knowledge and consequently in different theories of mind or modes of thinking about the mind at different ages. Knowledge and/or belief plays a central role in one's understanding of the nature and function of the mind. A theory of mind is as good as the knowledge base from which it is constructed. What is clear from these studies is that, instead of having an integrated knowledge base, younger children appear to have a loosely organized, and sometimes conflicting, explanatory framework. It is evident from these studies that children's understanding and utilization of sources of knowledge, and the consequences of knowledge on mental states, affect their theories of knowledge, consequently their theories of mind. In turn, the richness or deficiency in that theory of knowledge affects their level of conceptualization and/or reasoning about the mind. To the extent that a theory of knowledge is loosely organized, offers contradictory and often unreliable predictions and explanations of intentional overt human actions, has deficits in underlying processes such as representational change and the representational nature of the mind, the child displays a poor theory of mind. Older children appear to have more efficient theories of knowledge and have developed key underlying processes and constructs for a competent understanding of the nature and function of the mind.

2.3.3. Explanations from design issues

The third category of explanations for three year olds' problems in understanding the mind has been attributed to problems in research design. Several researchers charged that the false belief method, which is or became, the "litmus test" for the presence of a theory of mind and widely endorsed by a large body of subsequent studies, underestimated children's competencies (Wellman & Bartsch 1989; Chandler et. al 1989; Hala et al., 1991; Dalke, 1995; Siegal & Beatie, 1991; Hala et al., 1991; Fodor, 1992, 1991).

Wellman (1992) believed that false belief understanding is not the only test for the presence of a theory of mind and that mental state attribution is an equally valid and reliable test. Chandler et al (1986) and Hala et al. (1989) believed that if children were given meaningful tasks that personally involved them, they would display competent theories of mind at younger ages. Along the same lines, Dalke (1995) suggested that the false belief design did not apply to context-sensitive problem-solving schemes that were part of the child's general cognitive structures. Rather, it created artificial reasoning structures. From an ecological perspective, Dunn (1991 (a) (b), 1995) suggested that natural environments such as the family are good contexts for testing for the presence of a child's theory of mind. Children as young as three who are often faulted for deficits in conceptual understanding about the mind through the laboratory false belief task, show their understanding in teasing, joking, and differential communication with members of the family. Thus, although children fail laboratory tasks, their everyday lives and interactions with other people show that they have a theory of mind. This methodology appears to be appropriate because it searches for the

presence of theory of mind in everyday interactions. Recall that folk psychology is developed informally through interactions with others, and it is a commonsense understanding of everyday, intentional, overt actions. Despite the opposition to the false belief method, however, it remains the most researched, replicated, and endorsed design as a valid and reliable test for the presence of a theory of mind.

2.4. Factors influencing the development of a theory of mind

The role of environmental and/or contextual factors on the development of a theory of mind remains largely unexplored and a literature search on this topic shows that few studies exist. The major focus of the last decade has been identifying and describing developmental norms for a theory of mind during the preschool years. Dunn (1988, 1991 (b), 1994) studied the role of the family and Perner et al. (1993) the role of siblings.

Dunn investigated the development of a theory of mind within a social understanding framework. She studied the role of interaction within families and made the following findings. First, children used family relationships to test and develop their emerging theories of mind. Everyday situations in which siblings cooperate, compete, and confront each other offer opportunities for developing an understanding of other people. The intensity of sibling relationships provides children with opportunities to anticipate and predict each other's actions in order to effectively cooperate or compete with them. This finding is consistent with Perner et. al.'s (1993) finding that children with more siblings had more advanced theories of mind compared to those who had no siblings. The second finding was that

children relate differently to different members of the family. Dunn's conclusion was that because each relationship presents a different context for understanding other people, each relationship is negotiated differently. This suggests that children develop a theory of mind about each member of the family, because over time, they learn to read their minds. Dunn's last finding was that some families foster the development of theory of mind more than others. Dunn (1988) and Dunn and Brown (1993) found that family contexts that linked a child's actions to their effect on other people fostered their understanding of internal states and also the link between internal states and actions.

2.5. *Consequences of a theory of mind.*

To date there are few studies on the consequences of having a theory of mind. Dunn (1991, 1995) found that as children's theories change, so do their relationships with family members. More powerful models of the mind help them predict, anticipate and explain their own and other people's actions, and that understanding helps them negotiate their relationships differently with different family members. A child's relationships with other members of the family is dependent in part on the ability to discriminate between the minds of individual family members.

Astington and Jenkins (1995) found that children's overall performance on false belief tasks was linked to some measures of interaction during pretend play in school contexts. Children who passed false belief tasks engaged in more purposeful joint play because of their ability to predict and explain their peers' actions. Joint play requires making appropriate adjustments

in relation to other peoples' thinking processes. In their study, Lalonde and Chandler (1995) found a relationship between children's developing theories of mind and teacher ratings of some aspects of social maturity. Those who passed theory of mind tests appeared to have been rated as more mature than those who failed. These two studies are linked to successful adaptation to school contexts where cooperation is expected. The implication one may draw from these studies is that children with advanced theories of mind adjust better in school contexts than those with lower levels of reasoning about the mind.

Finally, Astington (1993) on the basis of findings that were beginning to emerge, suggested that the underlying processes of a theory of mind have significant impact on schooling. The studies reviewed so far show that representation and metarepresentation are crucial aspects for developing a theory of mind. These same processes are also relied upon, valued, and developed by schools. Astington believes that "schooling" involves a way of knowing and understanding the self, others, and the world; a kind of knowing that is different from that which is used out of school contexts. It relies on representation and metarepresentation, both of which are responsible for the development of a competent theory of mind and important for school learning.

Two implications can be drawn from Astington's propositions. First, that children with poorly developed theories of mind may find schooling difficult and/or may lag behind their peers and second, that individuals who find themselves in schools that encourage these skills while their culture places priorities somewhere else are also likely to encounter learning

problems. Problems they may encounter could be due to discordance between the school modes of reasoning on one hand, and indigenous cultures on the other. Also important is the notion that schooling facilitates children's representation and meta representation skills which in turn boost the development of a theory of mind. There is also the possibility that unschooled children miss opportunities for developing competent theories of mind, unless they get the opportunities in other contexts, such as in apprenticeship contexts at home.

2.6. Crosscultural research and a child's theory of mind

Crosscultural research on a child's theory of mind is sparse. Most studies carried out in the last decade were in Western social cultural contexts. However, there is a large body of research in anthropology on thinking (Heelas & Lock, 1981; Kim & Berry, 1993) and cognition (Cole, 1990; Wertsch, 1985; Rogoff & Gauvain, 1986), from which inferences about the development of a theory of mind can be drawn.

A large body of literature in anthropology shows that different cultures encourage different types of thinking (Hardman, 1981; Rosaldo, 1982; Duranti, 1985; Murkus & Kitayama, 1991; Schweder, Mahapatra & Miller, 1987 cited in Heelas & Lock (1981); Kim & Berry, 1993). For anthropologists, the major argument is that different cultures develop different folk psychologies, and therefore different theories of the mind. Folk psychologies are cultural tools used by different societies to script conceptualizations of the mind; consequently scripts for how the mind works will vary from culture to culture. Crosscultural studies in cognition suggest that different cultural contexts have different agendas, priorities, modes of

development, and consequently different cognitive outcomes. It is therefore possible that a theory of mind as an aspect of cognition, may also be a product of culture.

The post Piagetian approach of situating development in cultural context supports the anthropological position. Vygotsky (1978) lays out a fundamental argument for cognitive development in cultural context. Vygotsky denies the strict separation of the individual from his social environment. He believes that each culture defines the parameters and priorities for development. For Vygotsky, cognitive development, which he refers to as "higher mental functions" is embedded in culture. Vygotskian researchers such as Wertsch (1995), Rogoff (1990), Rogoff and Gauvain (1986) encouraged the study of cognition in cultural context because they believed that culture scripts development differently. For example, the Bushmen of the Kalahari are unlikely to learn about computers and children from Western societies are not likely to encounter pressure to learn about tracking animal footprints. The essence of this cross cultural literature is that culture is an organizer of human development, one aspect of which is a theory of mind.

Some crosscultural research on child's theory of mind has been carried out (Wahi & Johri, 1995; Avis & Harris, 1991; Gardner et al, 1988; Flavell, Zhang, Zou, Dong & Qui, 1983). Avis and Harris (1991) found belief-desire reasoning in two to six year old children from a North African preliterate society. This study confirmed Western findings that three and four-year-olds use belief-desire reasoning. Gardner et al. (1988) tested Japanese children on their understanding of apparent and real emotions, an aspect of "desire" in the belief-desire

reasoning system, and found that despite cultural differences between Western and Japanese related to the expression of emotions (Ekman, 1973), an age trend similar to one found in children from Western cultural environments existed . A general conclusion drawn from these studies is that the mode of reasoning (belief-desire) and its correlates found in children from Western societies appear to exist in non Western cultural environments. It is important to note however that, currently there are too few studies to draw any generalizations about development across cultures.

One study presents findings inconsistent with studies from Western cultural societies and the crosscultural studies reviewed above. Wahi and Johri (1995) replicated the mental-real distinction task, a correlate of a theory of mind, in three to eight year old Indian children, and found that culture was a significant variable. Three findings emerged from the study. First, three and four year-olds from both poor and upper class family backgrounds were unable to make the distinction. Recall that children in Wellman and Estes (1986) study performed at 72%, 86% and 92% for three, four, and five year olds respectively. Wahi and Johri children performed at 28%, 76% and 81% for ages 3-4, 5-6, 7-8 respectively. These results show that children in Wellman and Estes study significantly out performed Indian children. Within the study itself however, findings consistent with age trends were found. Performance improved with age. They suggested that these findings could not be explained by a developmental lag alone, because three and four year olds from both affluent and disadvantaged homes performed about the same level indicating a broader cultural factor.

The second finding was that, overall, there was a significant difference between affluent and disadvantaged children. The affluent group performed better than those from disadvantaged homes. The study suggested that this finding was a function of culture. They attributed differences between social classes as a function of exposure to Western-oriented schooling. Advantaged children had more access to Western oriented schooling that emphasized metacognition (Wahi & Johri, 1995). This conclusion appears to be consistent with Astington's (1993) concept of second order level thinking and her suggestion that schooling encourages second order thinking. Wahi and Johri also attributed differences between Indian and Western children in attainment of the mental-real distinctions to cultural priorities in development. Mental-real distinctions were probably not a priority for Indian communities, they suggested. This suggestion is consistent with crosscultural studies in cognition that propose that each culture scripts development differently. On the basis of these results, they questioned the universality of a theory of mind despite results from other cross cultural studies (Avis & Harris, 1991; Flavell et al., 1988; Gardner et al., 1988) that supported findings from the West.

These studies, although few and scattered do three things for cross cultural research on a theory of mind. First, their scarcity emphasizes the need to investigate this issue before making widespread generalization of its existence crossculturally. Second, the diversity of cultures demand more investigations to develop a data base for understanding how the phenomena play out in different cultures. Third, research that has been done crossculturally presents conflicting evidence e.g., (Avis & Harris, 1991 and Wahi & Johri, 1995). These

three issues create a knowledge gap about children's understanding of the mind in general, and in other cultures in particular. Cross cultural research may help illuminate on how the phenomena plays out in different cultural contexts.

2.7. Conclusion.

The research reviewed in this section suggests that children do not haphazardly reason about the mind. Their understanding of the nature and function of the mind and the problems they struggle with is organized into a belief-desire reasoning system. Older children have more powerful modes of reasoning than younger ones, and the reasoning between them is qualitatively different. In studies of a child's theory of mind carried out in the last decade, the theory-theory tradition has been the most productive in both scope and explanations for a child's understanding of the mind. Other perspectives have remained largely speculative and theoretical. Despite its lack of productivity compared to the theory-theory, the innate and enculturation hypotheses present the strongest justification for carrying out cross cultural studies. Rather than making the assumption that children's understanding of the mind is similar or different everywhere they present the researcher with ambiguities and paradoxes that requires new research. This study is a step toward that agenda.

The enculturation hypothesis not only presents persuasive arguments for examining a child's theory of mind in cultural context, but also directs the next generation of studies of cross cultural studies to examine external factors that may impact on the development of a child's theory of mind. Crosscultural studies can search for the universality of this phenomena and

also explore the influence of the environment on a child's understanding of the mind. The major question is, 'how do children in different non-Western societies reason about the mind?' It is a question that should be investigated by the next generation of research on a child's theory of mind. This study will investigate the existence of belief-desire reasoning in children from a literate but non western cultural context.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

3.1. *Design*

The research design, the phenomena under investigation (belief-desire reasoning), and the instruments used in this study are framed by the theory-theory tradition. The purpose of the study is to search for evidence of the existence of belief-desire reasoning, an explanatory framework for reasoning about the mind found in children from a less industrialized non-Western, but literate socio-cultural contexts. A pilot study to explore and field-test instruments was carried out and the findings were used to improve the design of this study (Dyanda, 1996). The study searched for the existence of belief-desire reasoning in eight-year-old, indigenous, schooled and unschooled children in Zimbabwe. This translated into the following design.

<i>Ethnicity</i>	=	Shona, Ndebele		
<i>School experience</i>	=	Schooled and unschooled		
		<i>Shona</i>	<i>Ndebele</i>	<i>Total</i>
<i>Schooled</i>		50	50	100
<i>UnSchooled</i>		50	50	100
<i>Total</i>		100	100	200

To search for evidence of belief-desire reasoning in eight-year-old, indigenous, schooled and unschooled Zimbabwean children, the study used a between and within group design. This design enables one to compare the performance of schooled and unschooled, Ndebele and

Shona and the four groups (Shona schooled, Shona unschooled, Ndebele schooled and Ndebele unschooled). Children were classified according to their school experience and ethnicity. This was an appropriate design for examining between and within group differences (Kerlinger, 1986; Hays, 1994; Cook & Campbell, 1976; Cone & Foster 1993).

The decision about the size of the sample used was made following Cone and Foster's (1993) guidelines on liberal and conservative requirements for sample size in quantitative research. The conservative approach includes any sample size between seven and twenty per variable. This study worked with eight variables. Gender, grade level, number of siblings, religion, and residence (demographic variables), ethnicity and school experience (independent variables) and belief-desire reasoning (dependent variable). Because the study hoped to shed light on the universality of belief-desire reasoning through evidence from children in Zimbabwe, a minimum of twenty subjects per variable was adopted to maximize the power of statistical analysis, results, and generalizability of findings to Zimbabwe. The study used a sample of 200 subjects.

The dependent measure was belief-desire reasoning. Three different methods were used to search for the existence of belief-desire reasoning. The majority of studies on a child's theory of mind carried out in the last decade used experimental methods. This study followed that approach as well. The instruments were the "mental state attribution" from Bartsch and Wellman (1989) and Wellman and Bartsch (1988); false belief (Wimmer & Perner, 1983) and unexpected change (Perner, Leekam, & Wimmer, 1987). All three methods search for

the child's understanding of the mind through belief-desire reasoning, but from different perspectives. The mode of presentation was story narratives about everyday, intentional and overt human actions. Language ability on its own has not been found to be an impediment for developing a theory of mind (Chandler, 1988; Happe', 1995). However, controls in the form of recall questions to ensure that children understand the events in the narrative/story before they are presented with the critical question are encouraged, so that a child's failure cannot be attributed to poor memory.

3.2. Geographical location of the study

Zimbabwe is divided into eight geographical provinces and four of them were used in this study: Mashonaland East, Manicaland, Midlands, and Matebeleland North. These provinces were selected for two reasons. First, to generalize results to Zimbabwe, a representative sample of Zimbabwe's eight provinces was necessary. Second, these provinces represent typical populations of the two ethnic groups, but sampled from different regions of the country. The dominant ethnic group for Matebeland North is Ndebele. The Ndebele are mainly located in two provinces, Matebeleland North and South. The Shona predominate in Mashonaland East and Manicaland. Midlands is the central region, and has a mixture of the two ethnic groups. Midlands was chosen to represent the population in the central region of the country. In addition, it had the potential for explaining some of the data because it is the only region where significant interaction between the two indigenous psychologies is evident.

3.3. The study sample

3.3.1. Characteristics of the sample

The sample consisted of eight-year-old, schooled, and non schooled children from Zimbabwe's two indigenous ethnic groups, the Shona and the Ndebele. The Shona make up 80% of the Zimbabwe's population and Ndebele 19%. The other groups are 100,000 White/Caucasian of British and/or other Western origin, 20,000 Asian, and 20,000 people of mixed origins. Zimbabwe has a population of approximately 11 million people (O'Toole, 1988).

The decision to use age eight was based on Western based studies and on my pilot data. Western based data show that belief-desire reasoning emerges between ages three and four (Wellman, 1992; Perner, 1991; Astington et al., 1988), and continues to develop through childhood (Wimmer & Perner 1983; Wellman, 1992 Perner, 1992; Astington, 1993; Astington et al., 1998; Lewis & Mitchell, 1994; Wimmer & Perner, 1988; Bartsch & Wellman, 1998; Robinson, 1994; Wimmer et al, 1988; Sodian, 1994; Wellman & Bartsch, 1994; Astington & Gopnik, 1988.). This study assumed that if belief-desire reason existed, it should be evident by age eight. In addition, my own pilot data from schooled Shona children from three provinces appeared to show that a developed belief-desire reasoning system was more evident in seven and eight year olds than four and five year olds.

The sample also included the other characteristics summarized below. Of the 200 children, 86 were male and 114 female; 86 were defined as following the Christian religion; 89 were

traditional; 23 mixed, i.e., Christian and traditional, and two could not be classified. The two children who were not classified did not respond to requests for their family's religion. The study used four out of the eight political regions of Zimbabwe. Eleven (11) children were from Mashonaland East, 49 from Manicaland, 53 from Midlands, and 87 from Matebeleland North. The study also requested information regarding the number of siblings for each child. One child had no siblings, 15 had one, 31, two; 55, three; 31, four; 65, five; and two did not provide information about the number of siblings they had. Although overall children were classified as schooled and unschooled, for those in school, specific grade levels were requested, and were as follows: Forty nine (49) were in second and 51, in third grade.

3.3.2. Method of selecting subjects

The study used purposive sampling to eliminate children who had known developmental problems that affected cognitive development and performance, and also geographical areas that had pervasive malnutrition in the past. Developmental delays, malnutrition and some cognitive handicaps have been linked to poor cognitive development and performance. It was important for the study to minimize poor performance due to causes other than the absence of belief-desire reasoning. Zimbabwe does not have standardized instruments to screen children who may be developmentally delayed, cognitively handicapped, nor systematic records to determine if malnutrition had occurred at some point in time. In the absence of formal and reliable instruments and records to screen children, intensive informal interviews with parents, guardians, and teachers were carried out to screen children. In addition, children were asked to retell short stories from the culture to further screen them for memory

problems. Children who could not satisfactorily retell the story or recall episodes of the story were eliminated. Two measures required the ability to listen and respond to narratives and it was important for the study to also rule out poor performance due to poor memory.

Schooled children were located through their educational districts and schools. Because non schooled children were unlikely to be involved in formally organized activities (such as schools), they were located through informal contacts such as neighbors, relatives, village leaders, community centers, and places where they worked e.g., in grazing lands herding cattle. Children who were not in school were selected from areas surrounding selected schools to minimize variation in environmental conditions between groups of children.

3.4. *Study variables*

3.4.1. *Independent variables.*

The study used two variables, ethnicity and schooling, to create groups from which evidence of belief desire reasoning was sought. These two variables are often linked to the development of cognition, including reasoning about the mind (Heelas & Lock, 1981; Kim & Berry, 1993 Olson, 1971; Brown, 1978, Huttenlocher, 1976; Rogoff, 1990; Cole, 1990). Post Piagetian research emphasizes examining children's development in cultural context (Feldman, 1992). Ethnicity is one of the significant variables that defines cultural context in non-Western societies (Mbiti, 1975; Gelfand, 1979; Bourdillon, 1987; Gelfand, 1992). Ethnic systems of reasoning about people and the world are passed down over generations through apprenticeship systems (Shumba, 1994; Bourdillon, 1987). Ethnic groups define

sources of knowledge and language about the mind, standards for judging peoples' actions, and provide experiences for fostering that understanding. The experience of schooling has been found to be a significant variable influencing cognitive development in non-Western societies (Wellman, 1992; Wahi & Johri, 1995; Olson, 1977; Brown, 1978; Huttenlocher, 1976). For example, Western type education systems have been found to impose fundamental changes on people's ways of knowing and views of the world, and differences in thinking modes between schooled and non schooled individuals have also been found (Olson, 1971; Brown, 1978, Huttenlocker, 1976; Wahi & Johri 1995). These variables were therefore considered appropriate independent variables for the study. The study operationalized these two variables as follows:

Ethnicity

Zimbabwe's indigenous cultures are patriarchal (Shumba, 1994). The consequence of this system is that the child's ethnic group is determined by the ethnic group of the father regardless of inter-ethnic marriages. For the purposes of this study however, special definitions were used to define the child's ethnic group. A child was assigned to an ethnic group only if both his parents were from the same group. Children from inter-ethnic marriages were excluded from the study.

Schooling experience

Children who were defined as having no experience in schooling excluded children who had dropped out of school. Only children who had never been to school, or who had attended

school for less than a term (semester) were regarded as unschooled. Eight-year-old schooled children would normally be in their third year of schooling; however, there is great variability in school entry age in Zimbabwe. Although the official school age entry level is six, it is not uncommon to find eight-year-olds in first or second grade. Because of the government's goal of universal primary education, no child is barred from school or any grade because of age, unless the child's age is too different from the other members of the class. Since age, and not grade level, was the initial criterion for subject selection, the study recruited eight-year-olds in second grade as well as those in third. These children participated because I believed they could explain data related to schooling experience if grade level trends were found.

Biographical variables

A limited number of variables for biographical data that had potential to explain some of the data were also considered. These were gender, grade level, number of siblings, religion, and geographical residence. Except for one, number of siblings, investigated by Perner et al. (1993) and Dunn (1991 a, b; 1994), no studies have examined their relationship to the development of a theory of mind. This study used them as exploratory variables.

3.4.2. Dependent Variable

There was one dependent variable in the study; belief-desire reasoning. Both the content and key underlying processes for this mode of reasoning were measured. Three different designs were used to search for this dependent variable.

3.5. *Instruments/ Materials.*

There are no standardized instruments in the field to test for the presence of a theory of mind. However, there are three measures frequently used and endorsed as competent tests for searching for children's understanding of the mind through belief-desire reasoning. They are the Wellman and Bartsch (1988), and Bartsch and Wellman (1989) mental state attribution, Wimmer and Perner (1983) false belief, and Perner et al., (1987) unexpected change designs. Historically, these three instruments are viewed as land marks in the study of a child's theory of mind and they were used to collect the data.

3.5.1. *Mental state attribution method (Wellman & Bartsch, 1988 and Bartsch & Wellman 1989, Appendix II.)*

This instrument tests whether a child uses a belief-desire mode of thinking in reasoning about the mind, and if he does, how competently he uses it. This understanding is sought through children's mental state attribution of belief and/or desire to the characters in a story. The tasks in the instrument use two major constructs of belief and desire within the belief-desire reasoning system. There are two parts to this measure. One part (Subtest 1) tests forward reasoning (prediction) and the other (Subtest 2) backward reasoning (justification). This study tested forward reasoning through prediction, and backward reasoning, through justification of those predictions. One modification to the instrument was made. Instead of using one character and name across all four short stories, different character names were used in each story to help children distinguish between the narratives. This modification helped to deal with the problem of redundancy in using one character in all stories. It also

helped clear up possible confusion that could arise in using one character in similar tasks. Wellman's studies used the same character in all tasks. Data from my own pilot study showed that children were confused by this use of character names. For example, the children in the pilot found the narratives confusing when in the belief attributed to the same character differed because although the stories were similar in content, and the same name was used in all, the beliefs attributed to that character were different in each story. The children challenged the interviewers saying, "that was not what the previous story said about...(name of character)."

This method is a reliable and valid test for belief-desire reasoning for five reasons. First, by giving children tasks that explicitly include belief-desire constructs, it provides children with the opportunity to demonstrate how efficiently they use or invoke that particular system and no other system. Second, by requiring them to explain their predictions, children are also provided with the opportunity to invoke any alternative systems. Thus, in the same measure one is able to test children's use of and competence in using the system, and also provide children with opportunities to invoke other system (s) than belief-desire. Third, the method requests children to listen to the narrative framed by a belief-desire mode, and then asks them to reason from it. Thus, instead of speculating that the child is probably using belief-desire reasoning, (which is the case in the original false belief and unexpected change designs) the child has to invoke it. Fourth, through justification of prediction, it tests children's understanding of the constructs of beliefs and desires when attributed to the same character. Finally, an historical perspective on the study of a child's theory of mind, this measure has

made significant contributions by providing an alternative assessment method, and also new findings about the development of the belief-desire reasoning systems.

3.5.2. The Traditional false-belief task: Wimmer and Perner (1983) (Appendix III)

This method is the oldest and most frequently used measure in the field. The child is presented with a narrative of a character with a false belief about the location of an item. The child is then asked to predict (forward reasoning) the characters action from that false belief. This measure not only searches for evidence of reasoning from false belief, but also reveals the child's understanding of the representational nature of the mind. In the false belief design, understanding the mind as representational is the litmus test for the presence of a theory of mind (Wimmer, & Perner, 1983; Perner, 1991).

This instrument has historical significance. It was the first instrument designed to test for the presence of a theory of mind and has been used repeatedly over the years. Over time, it became and is regarded as a valid and reliable litmus test for the presence of a theory of mind. Although attempts have been made to improve its design by changing the language, materials and questions (Glenn et al. 1993; Siegal & Beattie, 1991), the major tenets of "false belief" design have remained intact. Despite criticisms and modifications, there is more consensus on its validity and reliability than for any other instrument in the field.

I made an addition to this instrument that did not affect the overall design of the study. In addition to predicting the actor's behavior from false belief, children were asked to justify

their predictions. This addition was necessary to rule out other alternative reasoning systems. Furthermore, children's justifications could include qualitative data that would reveal other reasoning or alternative systems and/or reasoning strategies.

3.5.3. Perner, Leekam, and Wimmer (1987) Unexpected change task (Appendix IV)

A child is presented with a familiar box (SMARTIES in the UK, M&M's, in the US) with different contents, e.g., crayons. Before the container is opened, the child is then asked to predict (forward reasoning) the contents of the package. After prediction, the child is requested to predict what another person may think is in the package before opening it. The purpose of this task is to determine if children understand their own and other people's minds through their understanding of representational change. Representational change is one of the most important aspects of belief-desire reasoning and understanding the mind (Lachoo & Mitchell, 1994; Astington & Gopnik, 1988; Gopnik & Astington, 1988). Unlike the other two instruments that request children to recognize representational change, and predict the actions of other people, this instrument searches for the child's understanding of his own mind as well.

Three changes were made to all instruments to suit the Zimbabwean context relating to content, language, and mode of presentation. The content of the tasks were replaced with experiences familiar to Zimbabwean children. For example, in the Wellman and Bartsch instrument, herding cattle replaced searching for a kitten under the porch or piano. Herding cattle is a common experience for the majority of indigenous children in Zimbabwe. In the

false belief measure, sweets (local term for candy) replaced chocolate, and cupboards were replaced by bags. Indigenous Zimbabwe children have more experiences with candy than chocolate and most rural homes do not have cupboards. In the Unexpected change task, SMARTIES (UK) M&Ms (US) boxes were replaced by a the box of detergent box. In one remote study area, however, the detergent box was replaced by a box of matches because some children did not recognize the detergent package. Second, the language of the instruments was changed; they were translated into the two indigenous languages of Shona and Ndebele. Although English is the medium of instruction in schools from third grade, the language of commerce and industry, and some aspects of government, it is not the first language of most Zimbabweans.

Language is often a significant variable in discussions of cognition (Bartsch & Wellman, 1995; Fox, 1992). One's language marks descriptions and understandings of the mind, and is sometimes viewed as a cultural tool for thinking (Wellman, 1992; Vygotsky, 1978). In addition, crosscultural studies on language show that languages differ in syntax, lexicon, and semantics (Maratsos, 1988). The language about the mind that children would have encountered by eight years of age are likely to be that of first language, rather than English. For these reasons, the instruments were translated from English to the two indigenous languages. Children's responses were translated into English before coding.

The narrative mode of presentation was considered appropriate because Zimbabwe has a long- standing oral tradition. However, the story narration was modified to the local folktale

leading sentence "Once upon a time....", and stories were not read, but told. Pilot data information suggested that some younger schooled children viewed the stories and the questions as formal comprehension passages similar to those in school; for example, instead of identifying the characters and the beliefs and desires attributed to characters, some children replied that they got the answer from the passage. For example, "It is in the passage" or "I heard that as you read." When a narrative does not have a leading folklore sentence, such as "Once upon a time..", it is usually not regarded as a story, but a narration of ordinary everyday events; ordinary everyday events are not stories in the Zimbabwean context. A leading sentence of "Once upon a time" alleviated that problem and also focused the child to the characters in the story. Furthermore, because Zimbabwe has an history of oral tradition children understand "stories" as those told from memory rather than read from books. Beside these changes, the structure and principles of designing these tasks remained close to the original designs and did not affect the overall designs of these measures.

In summary, three measures and designs were used to search for evidence of belief desire reasoning. Inherent in these measures is not only a search for the content of the reasoning system, but for the understandings about the mind a child acquires through the childhood years if and as he develops a belief-desire reasoning system. Using three instruments rather than one, was recommended by Astington and Jenkins (1995) as a way to not only compensate for the weaknesses each may have when used alone, but also maximize the aspects of understanding of the mind being studied. The researcher hoped that together these three measures would present a comprehensive and rigorous test for belief desire reasoning

and the presence of a theory of mind in Zimbabwean children from which generalizations about the Zimbabwean context can be made. Such rigorous testing is necessary to gather credible evidence of a developed model of belief-desire reasoning.

3.6. Procedure

3.6.1. Task administrators

Two sets of research assistants worked in each region. The first set screened children for obvious developmental delays, cognitive competence through story telling, and any known health problems. The second set administered tasks in all three research instruments. Research assistants for screening children and administering tasks had to be different for each region not only to reduce costs, but also because of language and dialect differences. All research assistants were first speakers of the language spoken by the children.

All research assistants except two had four years of secondary education plus one or two years of teacher training experience. In Matebeleland North however, task administrators had only two years of secondary education. These were community members who spoke the children's dialect. Their supervisor, however, had four years of secondary education and a teaching experience of over ten years. Supervisors in two other regions had the following educational background: one supervisor had a Masters in Educational Psychology and the second a B.Ed. in Teacher Education.

3.6.2. Training for task administrators

To reduce task administration differences, intensive training was carried out in all regions. The major purpose of training was to reduce task administration differences and prepare the research assistants to tell rather than read stories. All research assistants worked under supervisors.

3.6.3. Task administration

Research assistants who collected data did not code children's responses, and vice versa. Supervisors and research assistants were blind to the hypothesis of the study and the principal researcher was not actively involved in collecting and coding children's responses. This approach was designed to reduce experimenter bias by limiting unintentional interference with data collection and coding processes (Cone & Foster, 1993). However, the principal investigator trained and supervised research assistants, and acted as referee during coding.

The three tests used in this study each had varying number of subtests. For the Wellman and Bartsch and Wimmer and Perner, there were two subtests in each measure; one for prediction, and the other for justification. The Perner et al had three subtests, and all were for prediction. The mode of presentation and structure of the tasks was similar in all three measures. Because the designs were similar, to minimize fatigue and task confusion, tests were presented in two sessions, rather than one, but on the same day and within the same time block. The Wellman and Bartsch measure was administered on its own because it had

eight tasks, and the other two together because the Wimmer and Perner and Perner et. al had two and three tasks respectively. The order of testing in the Wellman and Bartsch test as well as presentation was random.

Standard answer sheets (Appendix V) were used to record children's responses. Justification responses were written down as the child dictated them. All stories were told not read, however each interviewer had a standard story sheet for reference whenever necessary. When the examiner read the story it was done as discretely as possible. All answers were recorded at the time of the child's response, and all biographical data was completed before testing.

Schooled children were tested in schools, and non-schooled children wherever they were because it was not possible to transport them to one particular place. Attempts were made to get quiet rooms or places for administering the tests. The interviews took place in a quiet area or room with the examiner and interviewee sitting facing each other. Test administrators picked children for testing from a common pool, so that a child was not tested by the same examiner in all three measures. Children who had been tested went to a separate room/place from those still to be tested in order to prevent subject interaction before testing was complete.

3.7. *Data analysis*

Two kinds of analysis were used in this study. First was the global description of overall use and performance of the children in each measure, Second was an inferential analysis that compared performance between and within group performance using the independent/study and demographic variables. The descriptive level reports frequency scores to determine the level of children's use of belief-desire reasoning and the inferential, mean scores to compare the level of use between and within groups.

3.7.1. *Type of responses and scoring*

Two types of responses were collected, coded, and analyzed for all measures except for the Perner et al. One type of response was for prediction (forward reasoning) and the other for justification/explanation (backward reasoning). Each measure was scored and analyzed separately. The unexpected change measure had prediction tasks only. Responses were scored in the following two ways: First, as categorical data where children's responses were scored as positive when a child invoked belief-desire reasoning and negative when he did not. Second: as continuous data. A child was awarded a score of one (1) for invoking belief-desire reasoning and a zero (0) for negative responses. This coding system is common and is frequently used by studies in the field.

Inter coding agreement was set at $r.95$, a level viewed as appropriate for inter-coder reliability (Cone & Foster, 1993). Differences between coders were referred to a third coder (principal investigator) or through decided through discussion whenever necessary. Coders

were told that their data would be rechecked by an anonymous second coder. Cone and Foster (1993) and Romanczyk, Kent, Diament, and O'Leary (1973) argue that this approach is necessary to prevent inflated agreement of estimates. Inter-coder differences were very minimal, agreement was $r.97$. Disagreements in coding arose in task 4 of the Wellman and Bartsch test. Children's responses could either refer to the change in the character's mental state, or the character's access to new information. Some children did not specifically refer to access to new information, but to the character that gave the information. One coder ignored scoring responses with informational access and the other the name of the character who gave the information. These disagreements rose due to lack of clarity during training. Once the issues were clarified, there was general agreement on the coding.

3.7.2. *Statistical analysis*

3.7.2.1. The Chi-Square (X^2) statistic was used with categorical data. Categorical data was used to determine the number of children who invoked a belief-desire reasoning system and those who did not. The Chi-Square was used to check if children's responses as a group were above the level attributed to chance. A X^2 is an appropriate statistic for use with categorical data (Hays, 1993; Popham & Sirotnik, 1992).

3.7.2.2. A 2X2 ANOVA was used for continuous data and comparison of four group means. This statistic was used to compare performance between and within groups. This statistic is appropriate for examining between and within group differences (Hays, 1993). It was also used by Wahi and Johri, 1995.

- 3.7.2.3. T-tests were used to compare performance between the two ethnic and school experience groups.

3.8. *Performance Criterion*

There are no set standards for determining performance criterion in either the theoretical literature or the research. The study relied on common practices in the field, specifically those relating to the three instruments. In previous research three-year-olds who scored at the 70% level were credited with a theory of mind, and significance levels were set at $p < .05$ level (Wimmer & Perner, 1983; Wellman & Bartsch, 1988; Bartsch & Wellman, 1989; Perner Leekam & Wimmer, 1987). Since this study is looking for a developed model of belief-desire reasoning and the presence of a competent theory of mind, the cut off point for crediting children with belief-desire reasoning and a theory of mind was set at the 80% level in each measure. The significance level was set at $p < .05$ level, is a common significance level for social science research (Kerlinger, 1986). Since each measure had different number of tasks, performance constituting the preset 80% level in each measure was different.

The Wellman and Bartsch had four tasks, and each task had two parts, making a total of eight tasks. These eight were divided into two subtest. Subtest one was for prediction scores and subtest two required children to justify their predictions. On overall performance, only children who were positively scored for belief-desire reasoning on all six, seven, or eight of the tasks were considered predominant and competent users of belief-desire reasoning.

Children who invoked belief-desire reasoning on half the tasks were described as invoking belief-desire, but with low competence; those who scored below four but on at least one, were described as presenting a mixed pattern and less competent; and finally, those who did not invoke belief-desire reasoning on all tasks were described as non and inefficient users of belief-desire reasoning. Each subtest had four tasks. Competency in each of the two types of reasoning consisted of frequencies for children who were positively scored on all four and three tasks. Those who were scored positively on half the tasks were described as presenting a mixed pattern and also as low competency users, and those who were scored positively on one, were described as occasional and inefficient users. Finally, children who were negatively scored on all four tasks, were not only non users, but also inefficient in using a belief-desire framework. The Wimmer and Perner had two tasks and only those who invoked belief-desire reasoning in both were described as predominant and competent users of belief-desire reasoning. Those who invoked belief-desire reasoning on one task were described as presenting a mixed pattern. The Perner et. al. measure had three prediction tasks and only children who were positively scored on all three were considered predominant and competent users of belief-desire reasoning because the measure searched for representational change in all three tasks simultaneously. Those who were positively scored on two of three tasks were described as presenting a mixed pattern. In the Wimmer and Perner and Perner et al, measures, each subtest had one task.

3.9. *Informed consent*

Informed consent was sought from all children as well as their parents and/or guardians. Because of the literacy level of some parents especially rural parents, consent was also sought orally. Informed consent was therefore in both written and oral forms. In at least two regions, parents were reluctant to give individual consent. In these areas consent for all children and their parents was referred to and given by the traditional chief and/or village headman. This practice is not unusual in rural Zimbabwe. However, all children who participated in the study, including those who were given a blanket consent by their chief, were individually asked if they wanted to participate in the study. The form for informed consent was translated into the two ethnic languages (See Appendix VI for sample of informed consent for parents, and Appendix VII for children.)

CHAPTER IV

RESULTS

This chapter presents results for the four research questions the study set out to investigate. Each question was answered by results from three measures; those of Wellman and Bartsch, Wimmer and Perner; and Perner, Leekam, and Wimmer. In this study the correlation between these instruments were as follows: Perner, Leekam, and Wimmer and Wellman and Bartsch and Wimmer and Perner were $r = .20$ and $.19$ respectively; Wimmer and Perner and Wellman and Bartsch, $r = .42$.

To answer these questions, three measures on theory of mind framed by B-D were used to search for the existence of B-D including underlying processes and skills related to B-D reasoning. In addition, two of the measures (Wellman & Bartsch, Wimmer & Perner) also had the capacity to reveal other systems and/or explanatory frameworks that children used, if they did not use belief-desire. Since each instrument was independent, data were analyzed separately. The data answering each question were of two types; frequency and performance mean scores. Frequency scores were used to determine the prevalence of B-D in children's responses and their competency levels in using B-D. Performance scores were used to search for differences in performance between and within groups. The overall performance scores

and/or frequencies of occurrence in each measure are presented before subtest results. Each question will be answered in turn, beginning with the major and specific question.

Specific question

4.1. Do eight-year-old, indigenous, schooled and unschooled children in Zimbabwe construct, develop and use a belief-desire explanatory conceptual framework to reason about the mind?

Except for the Perner et al. measure, two sets of data from each instrument provided answers to this question. First the child's ability to predict the characters' actions given their mental states, and second, justification for those predictions by referring to the character's mental states. The Perner et al. did not include a justification, but did include three prediction tasks.

Overall the study found that eight-year-old, indigenous, schooled and unschooled children in Zimbabwe use a theory of mind framed by a B-D conceptual explanatory framework. In all three measures, children reached the preset 80% belief-desire frequency of occurrence level. In addition, there were no differences within and between groups on two measures; the Wimmer and Perner and Perner et. al. On the Wellman and Bartsch, school experience was found to have an effect on B-D. The schooled children did better than unschooled children. These findings emerged from results of four subquestions that guided this investigation. The results are presented under each subquestion.

4.1. *What conceptual explanatory framework do eight-year-old, indigenous, schooled and unschooled children in Zimbabwe invoke to predict and explain every day, intentional and overt human action?*

The results for this question in all three measures are presented as frequency of occurrence and competency in B-D. The study found that eight-year-old, indigenous, schooled and unschooled children in Zimbabwe invoked a B-D conceptual framework to predict and explain the characters' actions in the various narrative situations. This evidence emerged from children's ability to predict and justify the actors' actions by attributing and/or imputing mental states of "belief" and "desire" as the cause of their actions. The evidence supporting this conclusion is presented from results of three different B-D measures. Children's performance in each measure will be presented in turn.

4.1.2. *Performance on the Wellman and Bartsch measure*

The Wellman and Bartsch measure had eight tasks. Four required the child to predict the actors' actions and the other to justify those predictions. The purpose of these tasks was threefold; first, to search for the existence of B-D through evidence of children's use; second, search for other systems that children might use in place of, or with B-D; third, assess their level of competency in using the B-D system. Evidence for the existence of B-D and/or other systems was expected to emerge from children's justifications of their predictions.

Table 1 **Frequency of occurrence and competency in B-D (Wellman & Bartsch)**

Score	Frequency	Percent
0	-	-
1	2	1
2	1	.5
3	3	1.5
4	3	1.5
5	8	4
6	16	8
7	48	24
8	119	59.5
Total	200	100

The table shows the frequency of occurrence of B-D made by Zimbabwean children as a group. Fifty-nine percent (59.5%) of the children invoked B-D on all eight tasks, 24% did so on seven tasks and 8% on six. These three sets of data showed that 183 (91.5%) of the Zimbabwe children invoked a B-D framework. These children were described as predominant and competent users of B-D. Five percent (5.5%) who were scored positively on four and five tasks were described as users but of low competency and 3% presented a mixed pattern. They were scored positively on less than four out of eight tasks. Those who were positively scored on less than half were described as users but as less competent users. Based on 91.5% frequency of occurrence and competency, Zimbabwean children as a group were described as predominant and competent users of B-D when assessed by the Wellman and Bartsch measures.

The next two tables present data on children's use and competency in two subtests of the Wellman and Bartsch measure. The subtests searched for children's competency in forward (prediction) and backward (justification) reasoning. Forward reasoning (subtest 1) searched for children's competency in predicting actors actions given their mental states; and backward reasoning for the competence in explaining that prediction by attributing mental states of belief and/or desire as the cause of the actions. Children's overall performance in the two subtests showed that most children were predominant and competent users of B-D. They met the 80% preset level for prevalence and competency. The results from the two subtests are presented in tables 2 and 3 below.

Table 2 Performance on prediction (forward reasoning): Subtest 1 (Wellman & Bartsch)

Score	Frequency	Percent
0	1	.5
1	2	1
2	6	3
3	28	14
4	163	81.5
Total	200	100

In table 2, 81.5% of children made positive predictions in all four tasks, 14% three; 3% in two, 1% in one; and one child (.5%) did not invoke B-D reasoning on all four tasks. Two sets of frequency of occurrence (81.5% and 14%) suggested that 95.5% of Zimbabwean children

were predominant users of B-D reasoning and competent in forward reasoning. They could positively predict the character's actions given his mental state. Three percent (3%) presented a mixed pattern and two children (1%) were occasional and not competent users, and one child (.5%) did not invoke or show competency in B-D reasoning. With a performance of 95.5% frequency of occurrence and competency level in forward reasoning, Zimbabwean children as a group were judged as competent not only in forward reasoning, but also using B-D reasoning.

Table 3 Performance on justification (backward reasoning): Subtest 2 (Wellman & Bartsch)

Score	Frequency	Percent
0	3	1.5
1	5	2.5
2	6	3
3	38	19
4	146	73
No response	2	1
Total	200	100

Table 3 shows that 73% of the children justified their predictions by invoking a B-D framework on all four justification tasks; 19% on three tasks ; 3% on two; 2.5% on one, 1.5% did not invoke B-D reasoning on any justifications, and 1% did not respond to requests for justifications. Two sets of frequencies of occurrence for B-D (73% and 19%), suggested that 92% of the children predominantly invoked a B-D framework when they justified their

predictions. They attributed mental states of belief and desire as the cause of the actors' actions. No framework (s) other than B-D reasoning surfaced. Seven percent (7%) of the children, i.e., those who scored less than three, gave "non mentalistic" responses; that is they made no reference to the mental states of belief or desire. Children's overall performance showed that children were not only competent in backward reasoning, but also users of B-D. That is, they invoked mental states of belief and/or desire to justify the characters' actions. No other alternative framework emerged in children's responses.

Children negatively scored for B-D (Non mentalistic responses)

One of the purposes of justification tasks was to search for other explanatory frameworks that may be present either replacing, or working with a belief-desire system. Seven percent (7%) of the children who were negatively scored on some or all tasks gave non- mentalistic responses as the cause of the actors' actions. When requested to justify their predictions, they referred to some external cause unrelated to the actors' mental states. For example, to the question *"Why do you think Ranga (the name of the character) would search in location A?, the child responded "...because that's where there is plenty of grass or because that's where they normally graze."* There was no reference to the actor's mental states or the actors' belief about the location of the cattle. Another variation of the non mentalistic thinking were those responses that were definite about the location of the cattle when the narratives were tentative. For example, to the question, *"Why do you think Ranga will search for the cattle in location A, they responded " . . . because that's where they (the cattle) are."*

These types of responses were not scored positively for B-D for two reasons. First and foremost, although they made sense to experienced herders of cattle in Zimbabwe, because there was no reference to the actor's mental state, but to some conditions outside the individual, they could not be scored positively for B-D reasoning. The key issue in B-D reasoning is that every day, intentional and overt human actions are guided by the individual's internal mental states. Second, there was some level of ambiguity in these responses. It was not clear whether children assumed that the character knew his cattle always grazed there, that they would graze where there were good pastures, or that the child had heard in the story that the cattle were actually there. The last of these responses appeared to reflect some memory problems. While children who justified their prediction on the basis that there were good pastures in location A tended to get their memory questions right, those whose responses appeared to be definite about the location of the cattle had problems with memory questions.

Overall children's performance on the Wellman and Bartsch measure suggested that eight-year-old indigenous, schooled and unschooled children in Zimbabwe use a theory of mind framed by B-D reasoning. Furthermore, children's performance on prediction and justification subtests showed that they were competent in the two important types of reasoning that the Wellman and Bartsch measure search for; forward and backward reasoning. Their performance in both types of reasoning showed that they attributed mental states of belief and/or desire to predict or explain the actors' actions. Few children provided non-mentalistic responses on justifications for their predictions.

The next section presents three tables on results from the Wimmer and Perner measure. There were two tasks; one for prediction and the other for justification of that prediction. Although both forward and backward reasoning were being tested in this measure, its primary purpose was to search for a child's understanding of the representational nature of the mind; a key underlying skill/process and marker for understanding how the mind functions. It searched for the child's understanding of the representational nature of the mind through his awareness of the consequences of having a "false belief."

Since the measure had two tasks, only children who were scored positively on both tasks were judged as competent in understanding the mind as representational. Those who were positively scored on one were described as presenting a mixed pattern and displaying low competency in the use of B-D reasoning. The overall performance showed that the majority of children not only understood the consequences of a false belief, i.e., searching in the wrong place, but invoked and/or imputed false belief to the actor as the cause of his actions.

4.1.3. *Performance on the Wimmer and Perner measure*

Table 4 **Frequency of B-D reasoning occurrence and competency on understanding the representational nature of the mind. (Wimmer & Perner)**

Score	Frequency	Percent
0	6	3
1	9	4.5
2	185	92.5
Total	200	100

Table 4, shows that 92.5% of the children invoked B-D reasoning on both tasks, 4.5% on one, and 3% did not do so. Most of the children (92.5%) predominantly invoked and attributed the mental state of false belief as the cause of the actor's wrong search. The 92.5% frequency of occurrence of attribution of the mental state of "false belief" in children's responses and their competency in understanding the mind as representational, suggested that most eight-year-old Zimbabwean children were predominant and competent users of a B-D reasoning system.

The following two tables present data on two subtests of the Wimmer and Perner measure. The first subtest (prediction) was to search for the child's ability to reason from false belief (predict the actor's action state given his mental state of false belief), and subtest two (justification) the child's ability to invoke and impute the mental state of "false belief" as the cause of searching in the wrong place.

Table 5 Performance on the prediction task: Subtest 1 (Wimmer and Perner)

Score	Frequency	Percent
0	7	3.5
1	193	96.5
Total	200	100

Table 6 Performance on the justification task: Subtest 2. (Wimmer and Perner)

Score	Frequency	Percent
0	10	5
1	189	94.5
Non Responsive	1	.5
Total	200	100

Table 5, demonstrates that 96.5% of the children positively predicted where the character would search first, while seven (3.5%) did not. From table 6, we can see that 94.5% invoked and imputed the mental state of false belief as the cause of the character's searching in the wrong place, while 5% did not. One child did not respond to the justification question. The five percent (5%) who were scored negatively for B-D reasoning in table 6 reflected "realist thinking." To the question *"Why did Rudo (the character's name) search in location B (the wrong location according to the actor's belief?)* these 5% replied *"....because that is where the candy is right now.)* Thus they ignored the actor's mental state of false belief and the character's lack of access to new information about the item's movement from location A to B. The other 94.5% replied that the actor would search in the wrong place because of his

false belief about the location of the item even if they knew he was not going to find it since it was now at a different location than what he believed. Overall, therefore, performance on the Wimmer and Perner measure suggested that as a group, eight-year-old indigenous, schooled and unschooled Zimbabwean children understood the representational nature of the mind. The justifications for their predictions showed that they understood the consequences of acting on a false belief.

4.1.4. Performance on the Perner et. al. measure

This measure had three prediction tasks. Children who were scored positively on all three tasks could be described as having the capacity to "read" their own and other people's minds because the underlying skill and/or process of representational change was tested simultaneously by all three tasks. Children who scored positively on less than two were described as having a mixed pattern and as low competency users of the system. Overall performance on the Perner et al. measure presented evidence that most of the children understood the consequences of representational change, and therefore were able to read their own and other people's minds. The evidence is presented in tables 7, 8, 9, and 10.

Table 7 Frequency of B-D reasoning occurrence and competency on representational change (Perner et al.)

Score	Frequency	Percent
1	4	2.0
2	9	4.5
3	187	93.5
Total	200	Percent

Table 7 shows that 93.5% were able to predict their own and other people's minds because they displayed efficient understanding of representational change. These children were described as competent "readers" of their own and other people's minds because competency in reading one's own and other people's minds was evidence of B-D reasoning at work. Four percent (4.5%) achieved a score of two out of three tasks, while four children (2%) scored positively on only one out of three. This 4% was described as presenting a mixed pattern and as low competency users, and the 2% as occasional and less competent users of B-D reasoning. Every child invoked B-D reasoning on at least one out of three tasks.

The following two tables show the results of children's performance on the three subtests.

Table 8 Performance on prediction task 1: Subtest 1 (Perner et al.)

Score	Frequency	Percent
0	6	3
1	194	97
Total	200	100

Table 9: Performance on prediction task 2: Subtest 2 (Perner et al.)

Score	Frequency	Percent
0	1	0.5
1	199	99.5
Total	200	100

Table 10: Performance on prediction task 3: Subtest 3 (Perner et al.)

Score	Frequency	Percent
0	7	3.5
1	191	95.5
I don't know	2	1.0
Total	200	100

Table 8 shows that 97% of the children could predict the expected contents of the package based on their belief about of the usual contents of the package. Three percent (3%) named something other than the expected contents. Table 9 shows that 99.5% recognized changes in their own mental states while maintaining the stability of their original mental states, reflecting an awareness of their own mental activity. It appears that children who had predicted other contents in Task 1 now predicted what they originally expected to find, but chose to predict otherwise. Further probing of these children indicated that some thought that they were being tricked. These children were probed further and four of them said that they thought they were being tricked. Two others refused to explain why they originally thought there was something other than what they expected. Table 10 shows that 95% were able to predict what other people would say despite changes in their own mental states in Task 2, one child said he did not know, and 3.5% said they could not predict other people's thinking. Performance on all three subtests showed children performing over the preset 80% frequency of occurrence level suggesting that children were predominant and competent users of B-D reasoning.

The results the three measures presented so far (tables 1-10) suggest that to the question "*Do eight-year-old indigenous, schooled, and unschooled children in Zimbabwe construct, develop and use a belief-desire explanatory conceptual framework to reason about the mind?*" the answer is that yes they do. Zimbabwean children as a group predominantly and competently used a B-D reasoning explanatory conceptual framework to reason about the mind. They predominantly and competently invoked the mental states of belief and/or desire to predict and justify the actions of the characters in the narratives. Their predictions were not only consistent with B-D reasoning, but their justifications revealed that the content of their conceptual reasoning framework was belief-desire. All underlying processes, skills, and important markers consistent with B-D reasoning were searched for and found in all groups and in most of children. Few children displayed non mentalist thinking on the Wellman and Bartsch measure and 'realist' on the Wimmer and Perner measure.

4.2. How well do eight-year-old indigenous, schooled and unschooled children in Zimbabwe perform on B-D reasoning tests?

4.2.1. Performance as a group

The first set of data answering this subquestion was presented in tables 2-10. There was evidence that Zimbabwe children as a group, predominantly invoked and competently used B-D reasoning in all measures. In all three measures, children met the preset 80% performance level in both invoking and competently using B-D reasoning. On the Wellman and Bartsch measure, (Table 1) the children's responses were above chance at the $p < .000$ level $X^2 (7, N=200) = 472.32, p < .000$; subtest 1, Table 2 { $X^2 (4, N=200) = 484.85, p < .000$ };

subtest 2, Table 3, $X^2 (5, N = 200) = 485.02, p < .000$. The overall Wimmer and Perner performance in Table 4 was above chance at the $p < .000$ level. $X^2 (2, N=200) = 315.13, p < .000$. and subtest 1, table 5; $X^2 (1, N=2000) 172.98, p < .000$, and subtest 2, table 6; $X^2 (2, N=200) 337.33, p < .000$. On the Perner et.al. measure, overall performance was above chance at the $p < .000$ level $X^2 (2, N=200) = 321.9900, p < .000$ (table 7) and subtest 1, Table 8; subtest 2, table 9; and subtest 3, table 10; $X^2 (1, N=200) = 176.72, p < .000, X^2 (1, N=200) = 196.02$, and $X^2 (N=1, N=200) 348.0100, p < .000$ respectively. As a group therefore, eight-year-old, indigenous, schooled and unschooled Zimbabwean children performed competently.

The second set of data emerged from analyzing children's performance in specific groups. These results are presented below. The performance criterion for overall performance as well as performance in each measure was similar to that presented in Tables 1-10. Only overall performances in each measure are presented.

4.2.2. Performance of specific groups: Frequency of occurrence

Further evidence showing that children performed well on theory of mind measures emerged from an analysis of children's performance when grouped by their ethnicity, school experience and both school experience and ethnicity. The next section presents inter-ethnic, inter-school experience, and lastly performance based on school experience and ethnicity. When school experience and ethnicity were used to classify children, four groups emerged; Shona schooled, Shona unschooled, Ndebele schooled, and Ndebele unschooled. Overall,

the study found that all groups met the preset 80% level of frequency of occurrence and efficiency in using B-D reasoning.

4.2.2.1. *Inter-ethnic performance*

Table 11: Frequency of occurrence and competency on the Wellman and Bartsch measure: Shona group

Score	Frequency	Percent
0	-	-
1	-	-
2	-	-
3	-	-
4	2	2
5	7	7
6	9	9
7	25	25
8	57	57
Total	100	100

In Table 11, we can see that 91% of Shona children were positively scored for B-D reasoning (57% who were positively scored for B-D reasoning on all eight tasks, 25% on seven, and 9% on six). The rest (9%) were scored positively on at least four or five of the eight tasks. These presented a mixed pattern and were considered low competency users. The 90% level of performance by Shona children was evidence that they predominantly invoked, and were

competent in B-D reasoning. They surpassed the preset 80% mark for being described as predominant and competent users of B-D reasoning.

Table 12 **Frequency of occurrence and competency on the Wellman and Bartsch measure: Ndebele group**

Score	Frequency	Percent
0	-	-
1	2	2
2	1	1
3	3	3
4	1	1
5	1	1
6	7	7
7	23	23
8	62	62
Total	100	100

Table 12 demonstrates that 92% of Ndebele children invoked B-D reasoning, with 62% doing so on all eight tasks, 23% on seven, and 7% on six. Of that 8% invoked it sometimes. Of those 8%, 5% invoked it on less than half the tasks. Overall, the evidence showed that Ndebele children predominantly invoked B-D reasoning (92%). Although some did not reach levels where the data could confidently report a robust theory of mind, every child did invoke B-D reasoning in at least one or more tasks. No child scored negatively on all tasks. Ndebele children met the preset 80% level of performance to be described as predominant and competent users of B-D reasoning.

The performance of both ethnic groups on the Wellman and Bartsch measure showed that both groups scored at over a 90% frequency of occurrence level and another 10% displayed a mixed pattern. That over 90% of the children in both ethnic groups invoked B-D reasoning was evidence that both groups not only predominantly invoked B-D reasoning, but also used it competently.

Table 13 Frequency of occurrence and competency on Wimmer and Perner measure: Shona group

Score	Frequency	Percent
0	2	2
1	4	4
2	94	94
Total	100	100

Table 14 Frequency of occurrence and competency on Wimmer and Perner measure: Ndebele group

Score	Frequency	Percent
0	4	4
1	5	5
2	91	91
Total	100	100

Table 13 shows that 94%, invoked B-D reasoning, 4% did sometimes and 2% percent did not. Table 14 shows that at least 91% of the children invoked B-D reasoning on both tasks, 5% on one of the two, and 4% did not at all. Both groups met the preset 80% level for use

and competency. These results therefore suggested that both ethnic groups were predominant and competent users of B-D reasoning.

Table 15 **Frequency of occurrence and competency on the Perner et. al. measure: Shona group.**

Score	Frequency	Percent
1	3	3
2	6	6
3	91	91
Total	100	100

Table 16 **Frequency of occurrence and competency on the Perner et. al. measure: Ndebele group.**

Score	Frequency	Percent
1	1	1
2	3	3
3	96	96
Total	100	100

Table 15 and 16 show that 91% of Shona and 96% of Ndebele children showed evidence for B-D reasoning on all three tasks. In either group, both ethnic groups were positively scored on at least one of the tasks. No child was scored negatively for B-D reasoning on all three tasks. Both ethnic groups met the preset 80% level of use and competency and so can be described as predominant and competent users of B-D reasoning.

4.2.2.2. *Inter-school experience performance*

The performance of children across school experience in all three measures showed that both school experience groups met the preset 80% level to be described as predominant and competent users of B-D reasoning. This evidence is presented in Tables 17 to 20.

Table 17 Performance on the Wellman and Bartsch: Schooled group.

Score	Frequency	Percent
0	-	-
1	-	-
2	-	-
3	1	1
4	1	1
5	2	2
6	7	7
7	25	25
8	64	64
Total	100	100

Sixty-four percent (64%) of schooled children were positively scored for B-D reasoning on all eight tasks, 25% on seven, 7% on six out of eight (Table 17). These three sets of scores constitute 96%. All (99%) but one child, were positively scored for B-D reasoning on four or more of the eight tasks, however, only 96% (64% who invoked B-D reasoning on all eight tasks, 25% on seven and 7% on six) of those were described as predominant and competent users of B-D reasoning. Schooled children met the preset 80%.

Table 18 Performance on the Wellman and Bartsch :Unschoolled children

Score	Frequency	Percent
0	-	-
1	2	2
2	1	1
3	2	2
4	2	2
5	6	6
6	9	9
7	23	23
8	55	55
Total	100	100

Fifty-five percent (55%) of unschooled children invoked B-D reasoning on all eight tasks, 23% on seven, and 9% on six (table 18). Overall all children did invoke B-D reasoning on at least one task, 95% of them on at least four or more. Eighty-seven percent (87) of unschooled children (55% who invoked belief-desire on all eight tasks, 23% on seven and 9% on six) predominantly invoked B-D reasoning. Since they met the 80% preset level, they were described as predominantly invoking B-D reasoning and as competent users of the system.

The frequency of occurrence for B-D reasoning on the Wellman and Bartsch measure in schooled and unschooled children irrespective of ethnicity suggested that both groups were

predominant and competent users of B-D reasoning. Both met the 80% preset level for use and competency in B-D reasoning.

Table 19 Performance on Wimmer and Perner measure: schooled group

Score	Frequency	Percent
0	2	2
1	2	2
2	96	96
Total	100	100

Table 20 Performance on Wimmer and Perner measure: Unschooled group

Score	Frequency	Percentage
0	4	4
1	7	7
2	89	89
Total	100	100

Ninety-six percent (96%) of schooled children (table 19) and 89% unschooled (table 20) children predominantly and competently invoked B-D reasoning. Both met the preset 80% level. Two percent (2%) of schooled (Table 19) and 7% of unschooled children (Table 20) presented a mixed pattern. Another 2% of schooled (Table 20) and 4% of unschooled (Table 21) were negatively scored on both tasks.

Overall, under the Wimmer and Perner measure, the results suggested that both schooled and unschooled children could be described as predominant and competent users of B-D reasoning. Over 80% (96% schooled and 89% unschooled) of the children in each group invoked B-D reasoning on both tasks. Children's level of competency in this measure was evidence of their understanding of the representational nature of the mind, an important marker for the presence of a theory of mind framed by B-D reasoning.

Table 21 Performance on the Perner et.al. measure: Schooled group

Score	Frequency	Percent
0	-	-
1	2	2
2	3	3
3	95	95
Total	100	100

Table 22 Performance on the Perner et.al. measure: Unschooled group

Score	Frequency	Percent
1	2	2
2	6	6
3	92	92
Total	100	100

Table 21 shows that 95% of schooled children were positively scored for B-D reasoning on all three tasks, 3% on two, and 2% on one. No child was negatively scored on all three tasks. All children scored positively for B-D reasoning on at least one or more of the tasks. Ninety-two percent (92%) of unschooled children invoked B-D reasoning on all three prediction tasks, 6% two of three, and 2% (two children) on at least one of the three (Table 22). The performance levels of both groups presented evidence that they both understood representational change, an underlying skill for reading one's own and other people's minds. Schooled and unschooled performance on the Perner et. al. measure indicated that over 90% of children in either school experience group predominantly invoked B-D reasoning. Overall, the evidence suggested that both groups were predominant and competent users of B-D reasoning since they met the preset 80% level of performance.

The next set of data relates to performance of children when classified by two study variables; school experience and ethnicity. Overall all four groups (Shona schooled, Shona unschooled, Ndebele schooled and Ndebele unschooled) reached an 80% level of B-D reasoning frequency of occurrence and competency. Consistent performance of about 90% level between and within measures was not only evidence that all four groups predominantly invoked a theory of mind framed by B-D reasoning, but were also competent in using it.

4.2.2.3. *Performance by ethnicity and school experience; Shona schooled, Shona unschooled, Ndebele schooled and Ndebele unschooled*

Table 23 Performance on the Wellman and Bartsch: Shona schooled

Score	Frequency	Percent
0	-	-
1	-	-
2	-	-
3	-	-
4	1	2
5	1	2
6	2	4
7	13	26
8	32	64
Total	50	100

Sixty-four percent (64%) of Shona schooled children invoked B-D reasoning on all eight tasks, 26% on seven and 4% on six tasks (table 23). All children invoked B-D reasoning on at least four or more of the eight tasks. Ninety-four percent (94%) {64% who were score positively on all eight, 26% on seven and 4% on six} of the Shona schooled children predominantly and competently invoked B-D, reasoning while 4% presented a mixed pattern. Four percent (4%) invoked B-D reasoning on four and five out of eight tasks.

Table 24 Performance on the Wellman and Bartsch: Ndebele Schooled

Score	Frequency	Percent
0	-	-
1	-	-
2	-	-
3	1	2
4	-	-
5	1	2
6	5	10
7	12	24
8	32	64
Total	50	100

The results show that 64% of Ndebele schooled children invoked B-D reasoning on all eight tasks, 24% on seven, and 10% on six. All children invoked B-D reasoning on at least three or more tasks and 96% of them on half or more. Overall, 96% (62 % who invoked B-D reasoning on all eight, and 24% on seven, and 10% on six) of Ndebele schooled children predominantly invoked B-D reasoning while 4% presented a mixed pattern. An overall performance of over 80% was evidence of children's predominant use of and competency in B-D reasoning.

Table 25 Performance on the Wellman and Bartsch: Shona unschooled

Score	Frequency	Percent
0	-	-
1	-	-
2	-	-
3	-	-
4	1	2
5	5	10
6	7	14
7	12	24
8	25	50
Total	50	100

Fifty percent (50%) of Shona unschooled children were positively scored for B-D reasoning on all eight tasks, 24% on seven, 14% on six. All children were positively scored for B-D reasoning on at least four or more tasks. Overall the results show that 88% of Shona unschooled children predominantly and competently invoked B-D reasoning while 12% presented a mixed pattern. An over 80% level of frequency of occurrence was not only sufficient evidence of a high prevalence of B-D reasoning, but also that the children were competent users of this system.

Table 26 Performance on the Wellman and Bartsch: Ndebele unschooled

Score	Frequency	Percent
0	-	-
1	2	4
2	1	2
3	2	4
4	1	2
5	1	2
6	2	4
7	11	22
8	30	60
Total	50	100

Table 26 shows that 60% of Ndebele unschooled children were positively scored for B-D reasoning on all eight tasks, 22% on seven, and 4% on six. Ninety percent (90%) of the children were positively scored on four or more of the eight tasks while 10% were positively scored on less than half of the eight. All children were positively scored on at least one or more out of the eight tasks, but these appeared to show a mixed pattern. Overall, the table shows that 86% (60% scored positively on all eight tasks, 22% on seven, and 4% on six) of the Ndebele unschooled children predominantly invoked B-D reasoning. Performance above the 80% preset level, evidence of prevalence and competent use of B-D reasoning.

Overall, performance on the Wellman and Bartsch measure suggested that all four groups were predominant and competent users of B-D reasoning.

Table 27 Performance on the Wimmer and Perner: Shona schooled

Score	Frequency	Percent
0	-	-
1	-	-
2	50	100
Total	50	100

Table 28 Performance on the Wimmer and Perner: Ndebele schooled

Score	Frequency	Percent
0	2	4
1	2	4
2	46	92
Total	50	100

Table 29 Performance on the Wimmer and Perner: Shona unschooled.

Score	Frequency	Percent
0	2	4
1	4	8
2	44	88
Total	50	100

Table 30 Performance on the Wimmer and Perner: Ndebele unschooled

Score	Frequency	Percent
0	2	4
1	3	6
2	45	90
Total	50	100

Tables 27, 28, 29, and 30 show that all (100%) Shona schooled (Table 27); 92% Ndebele schooled, (Table 29); 88% Shona unschooled (table 29); and 90% (table 30), Ndebele unschooled performed beyond the 80% preset level. While Shona schooled children reached ceiling effects (100%), 4% Ndebele schooled, 8%, Shona unschooled, and (6%) of Ndebele unschooled children presented a mixed pattern. An over 80% performance level showed that children had the capacity to understand the representational nature of the mind, an important marker and underlying skill for understanding the presence of theory of mind framed by B-D reasoning.

Table 31 Performance on the Perner, et. al.: Shona schooled

Score	Frequency	Percent
0	-	-
1	2	4
2	2	4
3	46	92
Total	50	100

Table 32 Performance on the Perner, et. al.: Ndebele schooled

Score	Frequency	Percentage
0	-	-
1	-	-
2	1	2
3	49	98
Total	50	100

Table 33 Performance on the Perner, et. al.: Shona unschooled

Score	Frequency	Percentage
0	-	-
1	1	2
2	4	8
3	45	90
Total	50	100

Table 34 Performance on the Perner, et. al: Ndebele unschooled

Score	Frequency	Percentage
0	-	-
1	1	2
2	2	4
3	47	94
Total	50	100

In Table 31, 92% of Shona schooled children were scored positively for B-D reasoning on all three tasks, 4% on two, and another 4% on one. Children invoked B-D reasoning on at least one or more of the tasks. In Table 32, 98% percent of Ndebele schooled children were positively scored for B-D reasoning on all three tasks, and one child (2%) on two. From Table 33, we can see that 90% of Shona unschooled children were positively scored for B-D reasoning on all three tasks, and 8% on two and 2% (one child) on one task. No child was scored negatively for B-D reasoning on all three. All children invoked B-D reasoning on at least one or more tasks in Table 34, 94% of Ndebele unschooled children were positively scored for B-D reasoning on all three tasks, 4% on two out of three and two percent (2%) on one. Eight percent (8%) of Shona schooled (Table 31), 2% Ndebele schooled (table 32), 10% Shona unschooled (Table 33) and finally 6% Ndebele unschooled (Table 34) presented a mixed pattern. Overall, the performance of all four groups on the Perner et.al. reached the 80% preset level. Children displayed an understanding of representational change, an underlying capacity for understanding the nature of one's own and other people's minds. This

performance also suggested that all four groups predominantly invoked B-D reasoning and were competent users of the system.

To the question, *"How well do eight-year-old indigenous, schooled and unschooled children in Zimbabwe perform on B-D reasoning tests?"*, the evidence suggested that Zimbabwean children as a group, and between and within groups, met the preset 80% level. Their performance as a group was beyond chance levels. All groups performed well enough to be described as predominant and competent users of B-D reasoning. All important markers consistent with B-D reasoning were searched for and found.

4.3. *What difference if any, exists in performance on B-D reasoning tests among the different groups of children as defined by their ethnicity and school experience?*

To find if any differences in performance and/or explanatory systems existed between ethnic groups, school experience, and ethnicity and school experience groups, the following statistical tests were performed. T-tests were performed on the means of the two ethnic (Shona, Ndebele), and two school experience (schooled, unschooled) groups. To search for differences between the means of four groups (Shona schooled, Shona unschooled, Ndebele schooled and Ndebele unschooled), a 2x2 ANOVA was performed.

Overall the study found that on the Wellman and Bartsch measure, there were no significant differences in performance between ethnic groups, but there were between school experience groups. No statistically significant differences were found on the other measures on either

ethnicity or school experience. The results for each measure will be presented in turn. Presentation of the group comparisons will start with school experience, followed by ethnicity and finally ethnicity and school experience respectively.

4.3.1. Comparison by school experience

Comparison of performance by school experience using a T-test showed that although the unschooled performed less well than schooled children, there were no statistically significant differences between schooled and unschooled children on the Wimmer and Perner $t=1.62$ $p<.106$ and Perner et al. measure, $t=.62$ $p<.539$. There was however a statistically significant difference between schooled and unschooled children on the Wellman and Bartsch measure $t=2.40$ $p<.017$. On the Wellman and Bartsch measure, results suggested that, although both groups reached the preset 80% level for frequency of occurrence and competency in use of B-D reasoning, the schooled performed better than unschooled children.

4.3.2. Comparison by ethnicity

Comparison of performance by ethnicity using T-test showed no statistically significant differences between the two ethnic groups across all three measures $t=.39$, $p<.70$ on the Wellman and Bartsch, $t=.90$ $p<.370$; on Wimmer and Perner, and $t=1.44$ $p<.151$ on the Perner et al). Overall these results suggested that there were no significant differences in performance and use between the two ethnic groups.

4.3.3. Comparison by ethnicity and school experience

Table 35 Performance on the Wellman and Bartsch

	Table of means			
	Shona		Ndebele	
	M	SD	M	SD
Schooled	7.46	.90	7.46	.93
Unschoolled	7.10	1.11	6.96	1.88

Analysis of Variance: Performance between and within groups on Wellman and Bartsch

Source	D.F.	Sum Sq.	Mean Sq.	F ratio	F Prob.
Main Effects	2	9.490	4.745	2.931	.056
Ethnicity	1	.245	9.245	.151	.698
Schooling	2	.245	.245	5.711	.018
2-way interaction	1	.245	.245	.151	.698
Ethnicity schooling	1	.245	.245	.151	.698
Explained	3	9.735	3.245	2.005	.115
Residual	196	317.260	1.619		
Total	199	326.995	1.645		
N=200					

The schooled groups in either ethnic group had the same mean of 7.46, followed by Ndebele schooled ($X=7.10$), and Shona unschooled ($X=6.96$) respectively (table 35). A review of these means showed that both unschooled groups scored lower than schooled groups. A 2X2 ANOVA showed a significant main effect for school experience $F(1, 196) = 2.931$, $p < .056$), but not for ethnicity $F(1, 196) = .151$, $p < .698$). There were no statistically significant differences among the four groups (Shona schooled, Shona unschooled, Ndebele schooled, and Ndebele unschooled) on ethnicity. No interaction was found between ethnicity and

schooling $F(1, 196) = .151$ $p < .698$. There was however a significant difference between schooled and unschooled children $F(1, 196) = 5.711$ $p < .018$.

Table 36 Performance on the Wimmer and Perner

Table of means

	Shona		Ndebele	
	M	SD	M	SD
Schooled	2.00	.0000	1.88	.4352
Unschooled	1.88	.4677	1.86	.4522

N=50 per group.

Analysis of Variance: Performance between and within groups on Wimmer and Perner

Source	D.F.	Sum Sq.	Mean Sq.	F ratio	F Prob.
Main effects	2	.530	.265	1.730	.180
Ethnicity	1	.125	.125	.816	.367
Schooling.	1	.405	.405	2.644	.106
2-way interaction	1	.245	.245	1.600	.207
Ethnicity					
Schooling	1	.245	.245	1.600	.207
Explained	3	.775	.258	1.687	.171
Residual	196	.153	.153		
Total	199	30.795	.155		

N= 200

Results from table 37 showed that the highest mean score was achieved by Shona schooled ($M=2.00$) followed by Ndebele schooled and Shona unschooled both with $M=1.88$), and lastly Ndebele unschooled. Although these means were different, they were not statistically significantly different $F(3, 196) = 1.730$, $p < .180$ and there were no interaction effects $F \{1, 196, 1.600, p < .207$. The results suggested that all four groups performed at the same level. There were no statistically significant differences in performance competency and use of B-D reasoning between and among them.

Table 37 Performance on the Perner et.al.

	Table of Means			
	Shona		Ndebele	
	M	SD	M	SD
Schooled	2.88	.43	2.88	.14
Unschoolled	2.98	.38	2.92	.34
N=50 per group.				

Analysis of Variance: Performance between and within groups on Perner et. al.

Source	D.F.	Sum Sq.	Mean Sq.	F ratio	F Prob.
Main effects	2	.290	.145	1.224	.296
Ethnicity	1	.245	.245	2.068	.152
Schooling	1	.045	.045	.380	.538
2-way Interactions	1	.045	.045	.380	.538
Ethnicity					
Schooling	1	.045	.045	.380	.538
Explained	3	.335	.112	.943	.421
Residual	196	23.220	.118		
Total	199	23.555	.118		
N=200					

Table 37 shows that both Ndebele unschooled and Shona unschooled groups scored higher than Shona schooled and Ndebele schooled groups. The Shona unschooled had the highest mean of $M=2.98$, followed by Ndebele unschooled and with $M=2.92$ and Ndebele schooled and Shona schooled both with a mean of $M=2.88$. A comparison of the four-group means by a 2X2 ANOVA (table 40) showed no main effect for ethnicity or school experience $F(2, 196) = 1.224$ $p < .296$ or interaction $F(1,96) = .380$, $p < .583$. These results suggested that all four groups performed equally well despite the differences in their means. These differences were not statistically significant.

Several social background factors were also collected to help explain some data. These were number of siblings, religion, and gender. All three were found to have no main effects and interaction patterns to influence the dependent variable.

To the question *"What difference if any, exists in performance on B-D reasoning tests among the different groups of children as defined by their ethnic group and school experience?"*, the study found no statistically significant differences in the performance of the four groups across all three measures. On the two group comparisons, no statistically significant differences were found on the Wimmer and Perner and Perner et al., but on were on the Wellman and Bartsch. On the Wellman and Bartsch, there were statistically significant differences between the schooled and unschooled groups. Schooled children performed better than unschooled children. The lack of difference in performance between ethnic groups across all three measures and school experience groups on the Wimmer and Perner, and Perner et al., suggests no relationship between ethnicity and belief-desire reasoning. However there may be a relationship between some skills in the Wellman and Bartsch measure and schooling experience.

4.5. Summary of results

Overall the results of the study showed that

(1) Eight-year-old, indigenous, schooled and unschooled Zimbabwean children predominantly and competently invoked a belief-desire conceptual explanatory framework to predict and explain every day, intentional and overt human action. They invoked,

attributed and/or imputed mental states of belief and desire to individuals as the cause of their actions. The ability to attribute belief and desire to the characters for predicting and explaining their actions was evidence that children understood that the mind formed the causal link between the individual and his actions.

(2) All groups performed beyond the 80% preset level for describing a group as predominantly and competently using a belief-desire framework. Major developmental milestones consistent with powerful models of theories of mind within a B-D reasoning framework were searched for, and found in all groups of children.

(3) There were no statistically significant differences in performance between and within groups on two measures; the Wimmer and Perner and Perner et.al. On the Wellman and Bartsch measure, there was a significant difference between schooled, and unschooled, but not between ethnic groups. The schooled performed better than unschooled children.

(4) There appeared to be no relationship between ethnicity, school experience, ethnicity and school experience, and B-D reasoning on two measures; Wimmer and Perner and Perner et. al. There was a main effect for school experience on the Wellman & Bartsch, but not for ethnicity. There was a significant difference in performance between schooled and unschooled children. The schooled out performed the unschooled children. Three social background characteristics of gender, religion, and number of siblings appeared not to influence the use of, or to have any relationship with B-D reasoning.

CHAPTER V

DISCUSSION

The study's aim was to contribute to the debate on the universality of a theory of mind by searching for its existence in specific groups of Zimbabwean children. The broader question was whether B-D reasoning is a universal explanatory conceptual framework constructed, developed and used by children to reason about the mind. This study found that eight-year-old, indigenous, schooled and unschooled Zimbabwean children predominantly and competently invoked B-D reasoning to predict and explain every day, intentional and overt human actions. This answer emerged from the high frequency with which children invoked B-D reasoning in responding to questions put to them, and their efficiency in using the system. In addition, children also demonstrated evidence of using the processes and/or skills underlying B-D reasoning such as, the representational nature of the mind, representational change, forward and backward reasoning.

The results from the Wellman and Bartsch measure provided evidence that children were competent in both forward and backward reasoning; they invoked, attributed and/or imputed belief and/or desire as the cause of the individual's actions, demonstrating their understanding of the causal link between the individual and his actions. The Wimmer and Perner measure provided evidence that children understood the representational nature of the

mind and the independence between mind and reality; and finally, the Perner et al. measure provided evidence of understanding the role of representational change in predicting and explain one's own and other people's actions.

The findings are consistent with those from Western cultural contexts (Perner, 1991; Wellman, 1992; Astington et al, 1988; Lewis & Mitchell, 1994) and one study (Avis and Harris, 1991) carried out in North Africa. These findings conflict with those of Wahi and Johri who found culture to be a significant variable. However there are consistent with Wahi & Johri & Astington (1993) on the effect of schooling. There was a main effect for schooling on at least one measure.

The following discussion, will examine the framework invoked by the Zimbabwean children, the underlying processes and skills displayed, the children's competency in using B-D reasoning, and the extent to which these results and findings may contribute to the debate on the universality of a theory of mind. Finally, the study will suggest possible directions for future cross cultural research.

5.1. Zimbabwean children's use of B-D reasoning.

The discussion of children's use of B-D reasoning focusses on the content and underlying processes and/or skills of the explanatory system that children invoked to predict and explain every day, intentional and overt human actions. The content of the explanatory system invoked by children centers on the mental states that children attributed and/or imputed to

the characters in the narratives to predict and justify their actions. Processes and skills underlying the development of the explanatory system displayed by children will be examined in the context of children's efficiency in using B-D reasoning. In addition, non mentalist and/or non B-D reasoning responses will also be examined.

Theory of mind measures used in this study were of two types. The first required children to only predict (Perner et al.), while the second required prediction and justification of the character's actions (Wimmer & Perner and Wellman & Bartsch). Tasks that required the child to not only predict but also justify that prediction had the capacity to elicit the nature and/or content of the framework that the child used. A belief-desire framework includes the use of mental state terms of "belief" such as think, know, guess suspect, assume and "desires" such as want, hope, or wish among others. Wellman (1992), suggests that in the belief-desire framework, the two mental states of belief and desire are the content and language of the B-D reasoning conceptual explanatory framework.

From the results of this study, there is evidence that children used a belief-desire framework to explain every day intentional overt human action. They invoked and imputed mental states of belief and/or desire to predict and explain the characters' actions. Of particular importance to examine in Zimbabwean children's use of B-D reasoning, however, was their predominant use of the mental state of belief over desire. Desire was almost nonexistent in their justifications for predictions. If Zimbabwean children displayed a predominance of belief

over desire, was this still a belief-desire or different explanatory system altogether? Why was desire absent in most children's responses?

5.1.1. Zimbabwe children's predominant use of "belief" over "desire."

First, the literature, particularly the work of Wellman and Bartsch, sheds some light on whether or not Zimbabwean children's predominant use of belief over desire was part of a belief-desire explanatory system or something different. Discussing the developmental path for B-D reasoning, Wellman (1992, 1991), Bartsch and Wellman (1989, 1995) suggest that it progresses from simple desire, desire-belief, and lastly belief-desire psychology. The first stage (simple desire psychology), shows children's exclusive use of desire over belief; the second (desire-belief psychology), predominant use of desire over belief and lastly, a competent system (belief-desire) that equally considers both and also searches for the most relevant mental state to predict action or explain the observed one. In the last stage, the child not only considers both beliefs and desires, but also clearly understands distinctions between them in terms of their reliability in predicting and explaining every day, intentional and overt human action.

According to Wellman's and Bartsch's stages of B-D reasoning development, children in the first stage completely ignore belief and in the second, use desire over belief. Despite that imbalance in use of mental states, they are still described as using a belief-desire framework. Wellman (1992) also suggested that children progress from desire-belief to belief-desire when they suddenly discover that desire is not always a reliable mental state to predict and

explain intentional, overt human actions. The ability to consider both mental states and then choose the one that can successfully predict or explain the other person's actions is also a reflection of Wellman's last stage of development; a more powerful model of B-D reasoning compared to simple desire or desire-belief psychology. There is a possibility, therefore, that children in this study found the mental state of belief more reliable than desire to successfully predict and explain the characters' actions.

Since Wellman and Bartsch's two and early three-year-olds exclude "belief" in the first stage of their development of the framework, but are still described as operating within the framework, and there is also a possibility that Zimbabwean children's choice of belief over desire reflected their belief that "belief" more successfully predicted and explained the characters' actions than did desire. It seems unlikely that Zimbabwean children's predominant use of belief over desire is evidence of a different explanatory framework. Literature does not appear to suggest that an exclusion of desire implies that a different framework is being used. Rather, it may be evidence of a more powerful model of B-D reasoning, because children in Wellman's later stages of development appear to gradually rely more on belief than on desire. Use of belief over desire would seem to fit within a belief-desire conceptual explanatory framework.

The second explanation for this finding emerges from other studies carried out so far. Researchers other than Wellman and Bartsch exclude or ignore the mental state of desire from their discussions or investigations. They concentrate on children's understanding of belief. For example, the Wimmer and Perner measure often regarded as the "litmus test" for

the presence of a theory of mind and the "unexpected change task" from Perner et. al, credit children with a theory of mind on the basis of their understanding or use of belief alone and not both belief and desire. A review of literature on discussions and disagreements (Chandler, 1988; Chandler & Hala, 1994; Chandler Fritz, & Hala, 1989; Hala, Chandler, & Fritz, 1991; Perner, 1989; Wellman and Bartsch, 1989) on children's developing theories of mind, finds they often center on children's understanding of belief rather than desire. From the literature therefore, it appears that the nature of the framework itself is such that it either allows one to choose which mental state is relevant in searching for the presence of a theory of mind, or that the mental state of belief appears to have received more prominence in research and children's responses because it is the more relevant one in predicting and explaining people's actions and/or determining the presence of a theory of mind framed by B-D reasoning.

Since research appears to have a bias toward investigating children's understanding of belief over desire, and credits individuals with a theory of mind within a belief-desire framework by searching for their understanding of belief alone, this study rules out the notion that Zimbabwean children were using a framework other than belief-desire. Children relied on a mental state that is often the focus of significant research and discussion as a marker for the presence of a theory of mind.

The third explanation comes from the level of competence displayed by children in using a belief-desire framework. Although children appear to have predominantly used belief more

than desire, they understood stories that used both belief and desire mental state terms. If desire was not part of the framework they develop and use, then children should have found it difficult to understand the stories because they included a mental state unfamiliar to them in judging people's actions. The level of competency that children displayed, over 80% frequency of occurrence and competency across three measures sometimes reaching ceiling effects, would have been difficult to achieve if one of these mental states was "nonsensical" or unfamiliar to them in predicting and explaining human actions. Their level of performance on all three measures suggested that desire was part of a meaningful framework to and for them. Desire was probably just irrelevant to them for these tasks. A search for an explanation from the culture through an examination of folk tales showed that desire was a meaningful mental state for predicting and explaining everyday, intentional and overt human actions. A review of children's stories where people's actions are normally examined, showed that desire did feature. This use by the culture suggests that desire is a meaningful mental state to children in predicting and explaining people's actions.

The fourth explanation comes from the possibility that the nature and/or content of activity in the Wellman and Bartsch measure elicited from children a pragmatic approach to an activity very familiar to indigenous children in Zimbabwe. A desire to go and look for cattle in location B, when one believes they are in location A, appears not to fulfil one's goals of finding the cattle. The desire to search for the cattle in location A had to be consistent with the belief that they could be found there, suggesting belief would be the more relevant and appropriate mental state to invoke. Desire alone would not be enough. Inability to find lost

cattle, a chore most indigenous children perform from an early age of four or five, has consequences in the culture. Children get punished for failing to find lost cattle because cattle are not only the center of livelihood for most indigenous families (Makamure, 1992; Tsodzo, 1992; Bere-Chikara, 1992; Dore, 1992), but also the most valuable asset. The importance of cattle in the culture is clearly stated by Makamure (1992).

A man's social status is determined by how many herd of cattle he possesses. The larger the herd the more he is regarded as an important person in his society. ...the man with the largest herd gets the greatest honor at all functions... p 14.

Despite the importance society places on cattle, they are largely tended by small children. Through apprenticeship systems, over time, children become not only skillful at this task, but also aware of the role cattle play in their family and tribe; consequently, finding them when they are lost is crucial. A desire alone would not be enough -one has to find the cattle. The most pragmatic and efficient approach that leads to finding the cattle, in this case reference to belief, would get preference over others.

In this study, it appears Zimbabwean children believed "belief" was a more reliable mental state to "read" and justify one's own and other people's actions than was "desire." Thus, although children in this study appeared to totally exclude desire in their responses, they probably found belief a more relevant mental state in the tasks given them which may explain the predominance of belief over desire. There is a possibility that the predominance of belief over desire could have been due to the nature or content of the tasks in the modified version of the Wellman and Bartsch measure, and not necessarily a reflection of a different

explanatory framework. Even if the nature of the tasks themselves were not implicated in eliciting these responses, belief over desire also emerged in the Wimmer and Perner measures which had nothing to do with herding cattle. There appears therefore to be a broader explanatory conceptual framework at work, rather than just the nature of the task. I believe this explanatory system is belief-desire reasoning. Overall therefore this study rules out the notion that Zimbabwean children's predominant use of belief over desire reflects the use of a different framework.

5.1.2. Non-mental state non-B-D reasoning responses to request for justifications of predictions

Another finding under the content of the explanatory framework that needs attention is that, on the Wellman and Bartsch measure, children who were negatively scored on some or all justification tasks gave responses that were non-mentalistic, and consequently non B-D reasoning. To the question "*Why do you think the character would search at location A and not B?*", children responded that the location had *plenty of good pastures and water for the cattle*. Were these non mentalistic responses a reflection of a different framework other than belief-desire at work? There appear to be two explanations for these findings. The first can be found in the nature of the content for the Wellman and Bartsch measure; and the second, that non mentalistic responses was a reflection of less powerful models within B-D reasoning, rather than a different framework at play.

5.1.2.1. *Non mentalistic responses in the Wellman and Bartsch measure*

The above discussion made reference to the possibility that children took a pragmatic approach to an important and familiar activity in their lives. In the local Zimbabwean context, the reply "*...he will search there first because that is where there is plenty of grass,*" made sense because that is the more logical and reliable approach to take when searching for lost cattle.

Children appear to have relied on a common strategy used by children or herders of cattle in searching for lost cattle, and children's knowledge and experience of habits of cattle when they do not have a herder. In the local Zimbabwean context, a clever herder searches for lost cattle in areas where the pastures are greener and where there is plenty of water for them to drink because without a herder cattle stray to greener pastures. There is a possibility that attempts by the study, to make the task more relevant to the local situation, may have made it too contextually and experientially bound. That is, instead of reflecting on the current situation as it pertained to the narrative, children may have relied on their knowledge and experience about the activity of herding cattle.

As indicated above, it is possible that they believed that even if the actor believed the cattle were in location B when that location did not have plenty of grass and water for the cattle to graze and drink, the herder would not go there because he would not find them. Therefore to these children to say that the herder went to location A because *there was plenty of grass* could have been the more logical justification. The justification is not based on what the

herder is thinking in the story, but on the pragmatics of the activity: *"You go and search for lost cattle where there is plenty of grass and water because that is where one is likely to find them, rather than where the pastures are poor, or where you believe they are, when the pastures are poorer."* Another possibility is *"What is the point of searching in an area where you believe the cattle are if the cattle do not go there anyway, because the search should be lead by the characteristic behavior of the animals?"*, which would lead to the response " . . . *because that is where there is plenty of grass.*" The responses therefore, appear to be context and task bound, rather than reflecting a different and general framework for responding to all situations, as is the case with belief-desire framework. However, in the B-D reasoning context these responses were negatively scored because the respondents ignored the individual's mental state as the cause of his action.

It appears that if children used the logic presented above, maybe their responses contained an implied assumption that the herder had to believe that the cattle were where there were good pastures. Children may have reasoned that experienced headers of cattle would not think the cattle went to a location where there were poor pastures. Thus a justification such as *"..Because that is where there is plenty of grass,"* might have presumed that the character had to believe that was where the cattle were because there were good pastures, since cattle stray to good pastures. From a B-D reasoning perspective children made a wrong choice, but from the children's point of view the two may have been consistent in their minds, i.e., *"Who would believe the cattle were in location A when there were no good pastures?"* Thus, in terms of the priority justification, it was not that the character believed the cattle were in A,

but that there was plenty of grass and water for the cattle, that is why he believed the cattle were there and the herder had to search there. At some level therefore an implied understanding of belief cannot be ruled out, although it was not explicitly stated in children's responses. Rather than suggesting that these non mentalistic responses were a reflection of a different framework, if the implied assumption argument is not accepted, at best these responses were ambiguous. They required further probing to establish if belief was implied.

The third possible explanation is that there is a possibility that the non mentalist thinkers were reflecting the quality or level of efficiency of their models of theories of mind rather than using a different conceptual explanatory framework. In the Wellman and Bartsch measure, one of these less powerful, less developed consequently less efficient models is referred to as non-mentalist (Wellman, 1992). In the Wimmer and Perner measure these non mentalist thinkers are classified as 'realists'. In cases where a child is using realist thinking (as for example in the Wimmer and Perner measure where a character puts an item in location A and then in his absence it is moved to B), when children are asked to predict where the character would search, realist thinkers predict the character will search for candy where it currently is, because there is no point in searching where the item no longer is, if he really wants it (Mitchell, 1994). This kind of thinking is also non mentalistic because it disregards the mental state of the individual and makes a direct link between the sought after item and its location. In other cases, non-mentalistic thinkers misunderstand the belief question, but nonetheless make a correct prediction. Recall that Perner (1991), describes non mentalist thinkers in Wellman and Bartsch as "situation theorists." Situation theorists may

correctly predict the actions of the character even when they substitute "thinking that" as thinking of, or preferring location A. For example a statement such as "Jane thinks that the cat is under the piano" may be understood as "Jane is thinking of the piano so she will search under the piano or the cat prefers resting under the piano so she has to search under the piano." This preference approach appears to be what the argument between Perner (1989) and Wellman and Bartsch (1989) was about. Perner argued that three-year-olds do not understand belief and that in some cases, to these children, a belief is understood as a preference. He argued that situation theorists substitute belief for preference and still make a correct prediction. For example, if the belief question says *"John thinks that the cattle are at location A,"* a non mentalist thinker can equally predict location A not because he understands the role of belief, but because he just substituted preference for belief. Thus, besides the fact that the non-mentalist thinker may misunderstand "belief", this kind of thinking appears to be desire driven, a characteristic of early stages in Wellman's B-D reasoning developmental framework & less powerful model.

In the Wellman and Bartsch measure, Zimbabwean children who revealed non mentalistic responses appear to have used this logic. For example, the logic could have been as follows: *"If the character searches in location A, when the pastures there are poor, he is not going to get them. He should search where he is likely to find them if he is desperate to find them"* (desire driven). There is therefore a direct link between the desire to find the cattle and their location. There is no regard for what the actor himself believes is the location of

the cattle. It almost also appears as if it was a preference of location between greener and poorer pastures.

In the Wimmer and Perner measure the logic could have been, *"The candy is now in location B and if Rudo (the name of the character) wants this candy, she has to search where it is and not where she thinks she left it, because its no longer there. If she goes to search where she believes she left the candy she won't find it."* Again, there appears to be a direct link between the item and its location and no regard for the belief of the character about its location. This is an example of "copy theorists" who do not understand the independence between the mind and the world out there (Perner, 1991; Wellman, 1992). This type of thinking suffers from deficiencies in understanding the representational nature of the mind, distinctions between beliefs and desires, understanding of belief itself vis-a-vis preference, and also representational change.

If the child understood the mind as representational and the role of representational change in predicting people's actions he would be aware that the current location of the item does not influence the character's search because his mind represents the old location. Thus, although he likes the candy, he is going to make a wrong search because his mind has a different reality. If the child understood representational change he would acknowledge lack of access to information by the character on the item's new location, because the character did not know that it was moved, and that the character was relying on that old mental state to make a prediction. The lack of awareness about changes in one's own and other people's

mental states, is a characteristic of less powerful models of theories of mind within B-D reasoning (Gopnik & Astington, 1988; Gopnik & Graf, 1988; O'Neil & Gopnik, 1991; Ruffman & Olson, 1989).

In both cases (either in the Wimmer & Perner or Wellman & Bartsch measures), non mentalistic and realist thinking appears to be desire driven at the exclusion of belief. Because desire drives their thinking, these children disregard "belief," when it is probably the more reliable mental state for the search. Here again, the child makes a direct link between the location of the item and the desire to have it, disregarding the mental state of the character who is looking for it. Wellman (1992) enlightens us on the less powerful models children use in the early stages of the development of theories of mind. Desire driven models are limited in their capacity to predict and explain every day intentional and overt action, which is why older children gradually disregard them and/or rely more on belief. Non mentalistic thinking is a characteristic of less powerful models within the B-D reasoning system. The difference between non-mentalistic and mentalistic thinkers is that the former have less efficient models. Less efficient models such as those shown by non mentalistic and realist thinkers are part of the B-D reasoning system and not a reflection of another theoretical framework at play.

Whether Zimbabwean eight-year-olds should reflect less powerful models than those displayed by three year olds in other cultures cannot be answered by this study. Other than the reasoning that it is possible with a normal sample of two hundred children to have some

with less powerful models of thinking, this study did not search for age norms for the development of theories of mind for Zimbabwean children. In addition, the content of the tasks themselves (in the Wellman & Bartsch measure) could have been implicated in drawing these non mentalistic responses. Other reasons could also lie in the study's inability to establish baseline cognitive development equivalency data before testing. One cannot rule out that some of the non mentalistic thinkers probably were reflecting their general cognitive functioning levels, because these non mentalistic thinkers appeared to have had problems with memory questions in general.

Another answer ruling out non mentalistic thinking as a different theoretical conceptual explanatory system comes from the arguments between Wellman and Bartsch (1989) and Perner (1989). Perner believed that three-year-olds were non mentalistic thinkers and/or situation theorists; where as Wellman and Bartsch believed they were not. These arguments, although over three-years-old efficiency in using B-D reasoning, illuminate the findings of this study. Wellman and Bartsch and Perner were not arguing about whether three-year-olds' non mentalist thinking was a different mode of reasoning, a mode outside B-D reasoning system. Rather, they were discussing the progression of its development from non mentalistic to mentalistic thinking within a B-D reasoning system. For Perner non mentalist thinking was a characteristic of three-year-olds and for Wellman and Bartsch it was not. The move from non mentalistic to mentalist thinking was a developmental milestone children had to achieve. In this study there is a possibility that these children were still using these early models reflecting their struggle with a major developmental milestone of B-D reasoning.

If children were using realist or non mentalistic thinking, rather than suggesting that their responses were evidence of a model other than B-D reasoning, the evidence suggested that these children were using a less powerful model of judging every day intentional, overt human action. Realist and non mentalist thinking is evidence of children's developing theories of mind within a B-D reasoning framework and not outside of it. Another reason therefore that this study rules out the presence of a different model of reasoning on the basis of non mentalist, and/or realist thinking responses is that those responses reflected less powerful models within B-D reasoning. It is therefore more accurate to describe these responses as less powerful models which are consistent with the developmental path or hurdles children have to encounter and accomplish within a B-D reasoning framework, rather than suggesting that a different framework being used.

5.1.4. Processes and skills underlying the development of a theory of mind.

This part of the discussion focusses on the competency with which Zimbabwean children used a B-D reasoning framework. Overall there was a very high prevalence rate of invoking B-D reasoning. Children performed over the 80% preset competence level to be credited with a theory of mind and sometimes reached ceiling effects. The various processes and/or skills searched for by the three instruments, processes often used as markers for the presence of a theory of mind and associated with and also consistent with the development of B-D reasoning, were searched for and found in all groups of children.

The Wellman and Bartsch measure searched for two types of B-D reasoning; forward and backward reasoning. Forward reasoning was tested through prediction and backward through justification. From Wellman's overall conceptual framework, forward reasoning tests the child's ability to predict the actor's actions given his mental state, and backward reasoning his ability to explain a prediction by imputing mental states of belief and/or desire to the character as the cause of his actions. The two types of reasoning are therefore reverse processes. A predominant and competent B-D reasoning user should be able to use both types of reasoning.

Children's ability to demonstrate both these skills was evidence that not only did they possess the content of the belief-desire framework, but appropriate skills underlying the development of the explanatory framework displayed as well. They understood that mind and/or mental states of belief and desire in either direction were the causal link between the individual and his actions as the mediating variable. In Western contexts children displayed these skills by age four (Perner 1991) or Wellman (1992) by age three. If Zimbabwe children used this framework the study expected to find these skills, because the children were eight-year-old.

The Wimmer and Perner measure is the oldest and most commonly used instrument in the field for assessing the presence of theory of mind. It searches for the child's understanding of the mind as "representational" (Perner, 1991). The concept of the mind as representational involves the understanding that what the individual thinks is the situation is not a direct copy

of the situation out there, but only a representation of it. It may differ from reality. One may believe that the red book is in location A because he put it there when in fact another person moved it to location B. In this measure a child who understood the mind as representational was aware that Rudo, (the character who searched for the candy in the location she left it although it had been moved), did so because that was the reality represented in her mind, even though it was a different from the actual situation. Zimbabwean children's level of competency on this measure therefore suggested that these children could be credited with an understanding of the mind as representational; because they had passed the litmus test for the presence of a theory of mind. (Wimmer & Perner 1983; Perner, 1991). If these children did not understand the consequences of a false belief, for example, searching in the wrong place, and if they did not understand the mind as representational, a critical factor in B-D reasoning, they would have performed poorly. The instrument searched for children's understanding of the mind as representational and found it in all groups and in most of the children.

The third measure tested a child's understanding of his own and other people's minds through an understanding of representational change. According to Gopnik and Astington, 1988; Gopnik and Graf, 1988; O'Neil and Gopnik, 1991; Ruffman and Olson, 1989, representational change is the child's ability to acknowledge changes in his own and other people's mental states. While the other two measures searched for the presence of a theory of mind through the child's understanding of "other minds," this measure searched for evidence that the child also clearly understood his own. In this measure, a child's

understanding of representational change involved a simultaneous acknowledgment of changes (or lack of them) in one's own and other people's mental states, and also recognizing the consequences of these changes in mental states. Realist thinkers lacked this ability because they ignored the mental states of characters, or were not aware of changes or lack of them in the candy searcher (Rudo), whose mental state that caused her to look in the wrong place. Representational change is one of the struggles of children's developing theories of mind. The instrument searched for children's understanding of the concept of the role of representational change a necessary condition for understanding one's own and other people's minds and found it in all groups and in the majority of children.

Awareness of one's own mental state and those of other people is not only an aspect of efficient understanding of other people, but also one that offers successful adaptation to and with others during play in the early years and can also become an important "Machiavellian" tool. Dunn (1991, 1995), studying sibling relationships, found that children who had powerful models of theories of mind were able to anticipate, and predict their siblings' actions. Powerful models reduced conflicts because children could "read" their siblings' mind. Astington and Jenkins (1995), found that children with more powerful models for "reading" other people's minds were more successful at joint play because they were able to make appropriate adjustments to match or anticipate their partners' thinking processes. Dunn also further suggests that, as early as age three, using their theories of other minds as Machiavellian tools, children test their relationships with different members of the family, particularly their mothers. Positive relationships with others or fighting for competing

interests depends on the child's ability to discriminate his own mind and the minds of other family members and also to discriminate between them.

Overall therefore children's performance and display of processes and skills consistent with the development of B-D reasoning not only suggested that Zimbabwean children use a belief-desire framework, but also that they are competent users of this system. Their responses in three measures reflected a belief-desire content, errors made were consistent with less powerful models of B-D reasoning, and the skills that underlie, emerge from, or are consistent with B-D reasoning were clearly in place. In most studies of theories of mind, children are described as having a robust theory of mind after passing one measure. In this study, children performed well in three separate measures that test for different aspects of theory of mind. These findings are consistent with those from the West regarding competent models of B-D reasoning, and with Avis and Harris regarding the existence of B-D reasoning in other cultures.

5.2. The universality of a theory of mind

The foregoing discussion showed that there was evidence that Zimbabwean children not only used a belief-desire framework, and that the content, processes and skills displayed by the children were consistent with B-D reasoning, but also that they were efficient users of this system. By age eight, they had a well developed model of theory of mind. A major conclusion from this study, therefore, was that children from Zimbabwe, a less industrialized, non Western, but literate society use a belief-desire conceptual framework to reason about

the mind. The question that arises is what they mean for the debate on the universality of a theory of mind. The following discussion presents the argument that, on one hand, these findings contribute positively to the debate on the universality of theory of mind, but on the other they raise more questions than answers.

5.2.1 The prevalence of B-D reasoning

What do these findings mean to the debate on the universality of theory of mind? I believe that these findings show the existence and prevalence of B-D reasoning in cultural contexts different from those where the research has been conducted over the previous decade. In this study, the prevalence of B-D reasoning was found in four groups of Zimbabwean children with diverse cultural experiences. Children from two indigenous cultural groups who had two different school experiences invoked B-D reasoning equally and displayed key elements, processes and skills consistent with B-D reasoning. The contribution of these findings to the debate therefore, is that B-D reasoning surfaced in a different cultural context from those previously investigated. The more often the phenomena surfaces in different cultural contexts, the better the knowledge base from which to make conclusions about its universality. From that perspective, these findings therefore add to our knowledge about children's theories of mind and their prevalence in different cultural contexts. Recall Fodor's position on the prevalence of theories of mind:

There is so far as I know, no human group that doesn't explain human behavior by imputing beliefs and desires to the behavior. And if an anthropologist claimed to have found such a group I wouldn't believe him (Fodor, 1987 cited in Avis & Harris, 1991: 1.)

Although eight-year-old, indigenous, schooled and unschooled children in Zimbabwe impute beliefs and desires to explain everyday, intentional overt human behavior, I believe we still need more evidence of its prevalence in other cultural contexts before we can be as confident as Fodor.

5.2.2. Zimbabwe's folk psychology is a "mixed" folk psychology

Despite these findings there are limitations to the extent that one can make conclusions about universality. The major obstacle is that the findings fail to clarify some issues raised against assertions of universality of B-D reasoning. Some of the arguments, although speculative at this stage, are those put forward by Wellman (1992) and the "enculturation hypothesis." Wellman suggests that the development of a theory of mind is linked to self-agency, and self-agency is a Western cultural phenomena. The enculturation hypothesis argues that modes of thinking such as B-D reasoning are by-products of culture. Diversity in culture puts limitations on asserting the universality of a theory of mind. From the enculturation perspective, since B-D reasoning was found in Western contexts, it may be a by-product of Western cultural environments. Although Zimbabwe's cultural context is not defined as Western, it has pervasive Western cultural influence. It is not purely indigenous as was the case in the Avis and Harris (1991) study with Baka children, who were insulated from Western cultural influences. Today's Zimbabwean folk psychology may be a product of both Western and indigenous cultures, and therefore it may be a "mixed" folk psychology rather than one or the other. The complexity of the Zimbabwean cultural context thus limits the claim of universality of a theory of mind in the face of these two arguments. It is difficult to

make generalizations that Zimbabwean indigenous children use this mode of reasoning because one can neither confidently suggest that it is the product of indigenous or Western cultures alone, nor that indigenous cultures used it before Western cultural influences. Further still, it is difficult to suggest that indigenous cultures always used a B-D reasoning framework or continue to use it although there is pervasive Western cultural influence. This study does not competently tease out entangled variables in a mixed folk psychology to be able to attribute B-D reasoning as a by-product of one or the other. Schooling, a legacy of Western cultural influences that showed a significant link with B-D reasoning in the Wellman and Bartsch measure forms the central argument in the next discussion.

5.2.3. The role and effect of schooling on modes of thinking

Schooling is one of the major Western cultural institutions that has permeated indigenous cultures in Zimbabwe. The role of schooling in shaping a people's world view has been documented (Cole, 1990; Yehudi, 1977; Rogoff, 1990). In this study, in at least one out of three measures, schooling was found to have a significant link with B-D reasoning. The question that arises is whether the superior performance of schooled children on this measure was due to practice of an already prevalent mode of thinking, or to the Western cultural influence that is pervasive in Zimbabwe.

Despite the schooled children's superior performance on a B-D reasoning measure, the unschooled children met the preset 80% B-D reasoning level of occurrence in all three measures and the performance of unschooled children was not significantly different from

the schooled children on two other measures. If schooling was the origin of B-D reasoning, then unschooled children should not have reached the preset 80% level of prevalence in all measures including the Wellman and Bartsch, neither should they have performed equally well on two other measures. There were no significant differences in performance between schooled and unschooled children in the Wimmer and Perner and Perner et al. measures; two of the most frequently used measures for testing the presence of a theory of mind. One of the measures in which these differences did not surface is one often referred to as the "litmus" test for the presence of a theory of mind. Their schooled counterparts had been in school for at least two to three years and therefore should have performed much better than unschooled children.

On the other hand however, it is possible that the Wellman and Bartsch measure did have greater discriminating power than the other two. The Wellman and Bartsch measure had eight tasks, while the Wimmer and Perner and Perner et al. had two and three respectively. It is possible that the other two instruments masked schooled children's performance through lack of differentiation. Wellman (1992) claims that each task in their instrument examines a child's thinking from a different angle. While the discriminating power of the Wellman and Bartsch measure may be a probable reason for this difference, it is also important to acknowledge that despite the limited range of tasks in the Wimmer and Perner and Perner et al., measure. The number of tasks is not always a guarantee that the instrument is powerful. It is hard to argue that schooling alone accounts for the origin of this mode of reasoning.

The issue of schooling effects cannot be minimized, however. Yehudi (1977) clearly suggests that schools have specific well defined agendas and people are sent to these institutions to develop certain modes of thinking compared to others. Is the development of B-D reasoning one of these agendas? Schooling is one of the Western cultural legacies to indigenous cultures, one that significantly alters thinking patterns. If B-D reasoning is a monopoly of Western cultures, then significant differences should have been evident within and across all three measures between schooled and unschooled children. This suggests that schooling is not necessarily the origin of that mode of thinking, but may be a reinforcer. Thus, although the Wellman and Bartsch measure gives us an indication that schooling may have an influence on the development of B-D reasoning, it does not clarify whether schooling is the origin, reinforcer, or vehicle for its development. Astington, (1993) and Astington and Jenkins, (1995) and Wahi and Johri (1995) suggest that a competent theory of mind is rewarded in Western systems of education. Thus, the better performance displayed by schooled children on the Wellman and Bartsch measure could have been due to prior practice and rewards. There is also the possibility that Western institutions other than schooling could be a source of B-D reasoning. If schooling is not its origin, but rather Western influence in general, where did the unschooled children meet this influence?

Christianity is one of the dominant religions in Zimbabwe and carries with it Western modes of thinking. The effect of Christianity in most colonized countries has been to replace indigenous with Western modes of thinking. If unschooled children or their parents become Christians, it could have been an avenue for the development of B-D reasoning. It is

important to note however, that in this study, a child's religion was found to have no significant links with B-D reasoning. All groups; Traditional, Christians, and those who mixed both religions, performed at the same level.

However, despite their admiration for Western influences, especially in modernizing formal sectors of government, Zimbabwean indigenous cultures including the "well schooled" populace, remain ambivalent, skeptical, and resistant to acculturation to Western cultural practices, and to Western views about the world (Shumba 1994; Bourdillon, 1987). Furthermore, in some Third World countries where there has been Western colonialization, Western cultural influences faced major challenges soon after independence and sometimes whole revolutions are waged against them (Kim & Berry, 1993). Governments make formal attempts to erase, replace, or compete with Western influences (Moghaddam cited in Kim & Berry, 1993). Indigenous folk psychologies are resistant to manipulation by other cultures (Kim & Berry, 1993), especially Western cultural influences, because they carry with them the stigma of colonialization and domination.

Urbanization is also one of the instruments for acculturation, to Western ideologies and is a common feature of Zimbabwean society. Despite this urbanization, indigenous people are resistant to Western acculturation, and sometimes assimilation to Western cultural practices appears artificial. Gelfand (1992) makes the following observation.

... the urban Shona have not so much changed their own customs for western ones, but have added the latter (Western) to their own traditional ways..... p 185.

Writing about the indigenous populations resistance to western acculturation, Gelfand (1992) writes:

... The Shona have not by any means accepted the moral or spiritual teachings of the white man. They still prefer their own way of life They have greater regard for their way of life with its morals and manners. They look askance at much of Europe's behavior.

The level of efficiency at which children used B-D reasoning and displayed underlying skills casts doubt on the Western origin theory. Is it logical to attribute the high frequency rate of invoking B-D reasoning displayed by children from two different cultures and school experiences to acculturation of this mode of thinking through either formal or informal contacts by the eighth year of children's lives? Eight-year-olds, usually have little contact with formal organizations that have pervasive Western influences. Families are their closest cultural influences and as such a mode of thinking such as B-D reasoning may be attributed to the family, and/or other cultural influences. In rural areas for example, children's first formal and systematic contact with Western-oriented cultural practices is schooling. Children in Zimbabwe go to school at age six, sometimes seven or eight. If before age six they had acquired an indigenous folk psychology, does it disappear and get replaced by the one imparted through schooling in a period of three years when it took six to develop the other?

Some of the children from the Ndebele sample came from one of the remotest regions of Zimbabwe where their parents and neighbors had little contact with formal Western cultural institutions such as schooling and Christianity. The only institution that was beginning to emerge in that district was Catholicism and the nearest school was about thirty kilometers

away. More over most of the parents in these remote areas were not very committed to Christianity and even those who were becoming Christians, continued to cling to their own religion. Writing about the indigenous level of acculturation to Christianity Bourdillon (1991) says that the attraction to Christianity is most often utilitarian. When they become "nominal" Christians, they benefit from it because churches provide education, work and medical facilities to their converts. Bourdillon also suggests that in the majority of cases, they continue to cling to their own religion and way of thinking. Gelfand (1992) also adds that although Western schooling may be a vehicle for western thought, indigenous populations demand education for utilitarian purposes and not admiration for western cultural practices.

Overall therefore, the contribution of this study to the debate on the universality of theory of mind is two-sided. On one hand, there is a possibility that indigenous cultures use B-D reasoning regardless of pervasive Western cultural influences. On the other hand, since children with contact with one of the most powerful vehicle for transporting Western modes of thinking (schooling) performed better on one measure, this mode of reasoning probably cannot be wholly attributed to indigenous folk psychologies.

The Zimbabwe data provide evidence of the extent to which this mode of reasoning is prevalent in cultural contexts other than the West, but there is no strong evidence about its universality that can be drawn from it. It is difficult to conclusively say that indigenous cultures or Western cultural influences alone are responsible for the development of B-D

reasoning in Zimbabwean children, because the cultural context appears to be no longer "purely" indigenous or Western. Thus, it may be questionable to conclude that B-D reasoning is some natural phenomena in, or a by-product of indigenous cultures in Zimbabwe when there is pervasive Western influences. The same applies to the role of Western influences. In the face of mixed results and inability to tease out potential variables that may contribute to the development of B-D reasoning, in a mixed folk psychology a more logical and reasonable conclusion from these findings is that B-D reasoning is a common mode of thinking and reasoning about the mind in children from Zimbabwe, a less industrialized, but literate society; a mode of reasoning that may have been a product of interaction between two folk psychologies.

5.3. Implications for cross cultural research.

One implication for cross cultural research emerging from these findings are that there is a need to find methods that can tease out variables that get entangled in complex mixed folk psychologies. Second, studies need to be cautious about adapting instruments to suit local conditions, and finally, it is important to use multiple measures.

5.3.1. Methodologies that extricate potential variables

In the face of suggestions that the origin of B-D reasoning is Western, it may not be enough for cross cultural research to just establish that children from other cultural contexts. develop and construct and use B-D reasoning especially when Western cultural practices are pervasive in those cultures. Arguments about origin are fundamental to debates on the

universality of B-D reasoning. There is therefore need to carry out longitudinal studies that trace the developmental path of B-D reasoning including the norms for each age. If children of various ages are followed over time, one can tease out other issues such as schooling and speak with confidence about its developmental path. For example, although this study found that children were predominant and competent users of B-D reasoning and demonstrated that important B-D reasoning skills were present, little can be said about its developmental path. Establishing the developmental path and comparing it with routes identified in other cultures may be another way of establishing the universality of this mode of reasoning. In addition, longitudinal studies may be important because they study children over long periods of time in their cultural contexts. Modes of thinking such as B-D reasoning need to be studied along with the cultural contexts that nurture them (Rogoff et. al, 1984; Rogoff, 1990; Cole, 1993). Such approaches can probably meet the challenge of anthropologists and other developmental psychologists who assert that modes of thinking are constructed by culture. Examining the developmental phenomena in cultural context over long periods of time may help answer the concerns of the enculturation hypothesis and some anthropologists. Longitudinal studies therefore, have potential and may be an appropriate way of gathering data about the universality of a theory of mind.

5.3.2. Adopting and adapting measures to suit local cultural contexts.

The second implication relates to adapting theory of mind measures from other cultural contexts to suit local conditions. In this study, on the one hand it appears that measures designed for Western cultural contexts were successfully adopted and adapted to suit local

cultural contexts. Inability to understand tasks was not one of the problems of this study. On the other hand however, there is also good reason to believe that the adaptations used in this study elicited context and cultural specific responses. There is a possibility that the activity used in the Wellman and Bartsch measure (herding cattle) was culturally bound, resulting in children ignoring the content of the narrative and drawing from their cultural experience of that activity. It is my belief that the task of herding cattle was culture specific to the extent that the content of the task may have been implicated in drawing from children non mentalistic responses. The responses children gave made sense in the Zimbabwean context, but were scored negatively for B-D reasoning because they were non mentalistic. (They ignored the mental state of the characters.) Finding appropriate instruments for local contexts therefore, should be balanced with maintaining reasonably "culture free" measures and tasks more so when the objective of the study is to search for data that cross cultural boundaries.

5.3.3. Use of multiple measures to assess the presence of B-D reasoning

Since no one instrument has the capacity to test all aspects of the construct of a theory of mind, use of multiple measures not only ensures that a wide range of skills are searched for, but also helps determine the strength or robustness of the theory. More important however, is that issues that may not be elicited by one measure may be picked up by another. While the Wimmer and Perner and the Perner et al.'s measures failed to pick any differences between schooled and unschooled children, the Wellman and Bartsch did and vice versa. Future studies will be able to pursue the issue of schooling, where as, if only one measure had been used, this important variable could have been missed. Use of more than one

measure to test the presence of theory of mind in other cultures is therefore particularly useful in determining the existence or robustness of the theory.

5.4. *Limitations of the study*

The limitations of the study were around validity and reliability issues, use of several task administrators, and inability to use standardized screening instruments to establish equivalence and/or baseline cognitive competence data, and finally, the limited population of unschooled children.

5.4.1. *Reliability and validity of instruments*

A major problem in using theory of mind measures at this stage is their validity and reliability. These measures have not undergone rigorous psychometric testing. Researchers appear to choose among them based on their popularity and/or frequent use by other researchers. In this study, correlational statistics showed very low relationships between these instruments. Although the low levels suggested that there was some relationship, if these instruments measured the same construct that of theory of mind, a higher correlation should have been found. An examination of these instruments shows that, although they are all used by theory of mind researchers as tests for measuring the presence of a theory of mind, they do not necessarily measure the same skills, but rather different aspects of the same construct. For example, the Wellman and Bartsch forward and backward reasoning, the Wimmer and Perner a child's understanding of the mind as representational nature of the mind; and Perner et al. representational change. Thus, although at one level they appear to

be measuring the same skills, on the other, they are measuring different aspects of the same construct. Moreover, although by inference children rely on some basic underlying skill(s), there is no direct evidence that there is/are a common underlying skill(s) that these instruments search for, hence the argument between Wellman and Bartsch (1989), Perner (1989), Chandler et al. (1989), and Sodian et al. (1991) and Perner, et al. (Sodian et al (1991). Psychometric testing may be able to unravel any common underlying skills that these measures search for, and researchers may be able to systematically choose between them, rather than any instrument they prefer, believe is reliable, or assume measures, and/or searches for the same construct or common underlying skills.

5.4.2. Lack of standardized instruments to establish cognitive equivalence.

The absence of a standardized instrument to establish baseline cognitive competence data, and lack of reliable health records to screen for environmental factors that may affect the development of cognition; for example, malnutrition, was a problem.

The study was unable to find reliable instruments to establish cognitive competence equivalence or base line cognitive data before testing. In the absence of such an instrument, simple narratives from the culture were used to test children's ability to follow and remember a story since that was the mode of task presentation. This method of screening although useful was not fully adequate. The study speculates that some of the less powerful models of B-D reasoning that emerged from children's responses may have been due to generally poor cognitive competence.

The study was not also able to find systematic records on the children's health. In the absence of formal records that documented the health history of a child, the study relied on information from parents, guardians and extended family members who sometimes did not know the child's history, or who were reluctant to share and/or give it. Systematic malnutrition has been linked to poor cognitive development. Health records and standardized cognitive measures would have been more reliable and useful in finding out more about children's cognitive competence.

5.4.3. Use of multiple task administrators

The third problems was lack of resources, and participation of children from two different cultural and linguistic groups. Compounding these problems was the fact that in one region, two administrators had lower academic qualifications compared to those from the other regions. Because of the need to use community members who spoke a local language and dialect, the study had no choice but use them. These two administrators had two years of secondary education, while the others had four as well as one or two years of teacher training experience. Despite intensive training on task administration, establishing equity in task administration was problematic. Close monitoring in all regions was necessary. Even then, there was no way of being sure that a certain a minimum standard was followed by all task administrators in all regions. The ease and difficulty that some children experienced during testing could have been influenced by differences in task administrators educational backgrounds and/or experience or style in interviewing children in general. If all groups of

children had been interviewed by the same administrators, the conditions would have been more similar.

5.4.4. *Selection of the sample*

The fourth problem was related to the selection of the sample particularly the unschooled children. The two main problems relating to this sample were first, a limited pool from which to select the sample; and second, authenticating ages. While there was no difficulty in making a random sample for schooled children once the informal screening was done, the pool from which unschooled children were selected was limited. Since gaining independence (1980), Zimbabwe embarked on free universal primary education and that policy resulted in more children going to school. The pool for unschooled children was therefore made smaller than that for schooled children. The determination of ages for the unschooled sample was also problematic. Most of the unschooled children did not have valid birth certificate records to authenticate the given ages, whereas all schooled children had. For schooled children, ages were extracted from official school records, whereas for the unschooled sample, the study had to rely on the children, parents, guardians, peers and friends to determine their age. For the unschooled sample therefore, there is a possibility that although the ages were given as eight, some of them may have been below or above age eight.

5.5. *Conclusion*

The findings of the study are that children from a less industrialized, but literate society used a belief-desire conceptual explanatory system to predict and explain every day, intentional,

overt human action. Children imputed mental states of belief and/or desire to characters in narratives to predict and explain their actions. All groups of children did not only predominantly invoke B-D reasoning, but were also competent in using it. The study searched for B-D reasoning using three instruments and consistently found important markers of theory of mind in place. In the Wellman and Bartsch measure, school experience was found to have some relationship with B-D reasoning, but not in two others. No significant differences were found between ethnic groups and when children were classified by both ethnicity and school experience.

An examination of the findings appears to suggest that the debate on the universality of a theory of mind is far from over. Cross cultural research needs to find methodologies that can tease out complicated links between variables when there is a mixture of folk psychologies. Future studies need to search for methodologies that can extricate indigenous and Western modes of thinking to contribute meaningfully to the debate on the origin and universality of a theory of mind. However, one of the major contributions of this study to the debate on the universality of theory of mind was that the study provided evidence that children from a different non-Western, less industrialized, but literate society use a belief-desire conceptual framework.

APPENDIX I
WELLMAN AND BARTSCH (1988); AND BARTSCH AND WELLMAN, (1989) MENTAL
STATE ATTRIBUTION DESIGN: ORIGINAL VERSION

Appendix I

Wellman and Bartsch (1988) and Bartsch and Wellman, (1989) Mental State Attribution Design: Original version

Forward Reasoning: Prediction on an actor's behavior

The stories were presented in a series and sets to control for alternative reasoning schemes. A set of four stories from that paradigm are described below:

Task	Example of story
Standard belief	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is under the porch. Where will Sam look for his puppy (garage or porch?)
Not Belief	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is not in the garage. Where will Sam look for his puppy?
Not own Belief	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Where do you think Sam's puppy is? (When the child answers the experimenter says. That's a good guess, but Sam thinks his puppy in the garage. Where will Sam look for his puppy?)
Changed Belief	Sam wants to find his puppy. It might be hiding in the garage or under the porch. Sam thinks his puppy is under the porch. Where will Sam look for his puppy?

But, before Sam can look for his puppy Sam's mom comes out of the house. Sam's mom says she saw his puppy in the garage. So now he thinks his puppy is in the garage. Where will Sam look for his puppy?

Backward reasoning: Explaining an actor's behaviour.

Here is Jane. Jane is looking for her kitten under the piano. Why do you think Jane is doing that?

Here is Joe. This is candy. Joe is putting it in his mouth. Why do you think Joe is doing that?

Here is Mary, Mary is going to buy an ice cream at the grocery store. Why do you think Mary is doing that?

Here is Beth. Beth hates apples. But she is taking a bite out of this apple. Why do you think Beth is doing that?

Here is Jane. Jane hates frogs. But Jane is looking for a frog under the piano. Why do you think Jane is doing that?

Here is Jane. Jane is looking for her kitten. The kitten is hiding under the chair. But Jane is looking for it under the piano. Why do you think Jane is doing that?

Here's Sam. This is a rock that looks like a peanut. But Sam is putting it in his mouth. Why do you think Sam is doing that?

Here's Andrew. Andrew is going to the drug store. The drugstore does not sell balloons. But Andrew is going to the drug store to buy a balloon. Why do you think Andrew is doing that?

APPENDIX II
WELLMAN AND BARTSCH (1988) AND BARTSCH AND WELLMAN (1989)
MENTAL STATE ATTRIBUTION MEASURE: MODIFIED VERSION

APPENDIX II

Wellman and Bartsch (1988) and Bartsch and Wellman (1989) Mental State Attribution Measure : Modified Version

TASK 1: STANDARD BELIEF

Farai wants to look for his cattle in the pastures. The cattle may be grazing around Mutero's area or around Chikoore's. Farai thinks they are at Chikoore's.

Memory Question:

Where does Farai think they are grazing?

Belief Questions

- (a) Prediction: Where will Farai look for the cattle first? (Is it at Mutero's or Chikoore's?).
- (b) Justification : Why do you say that?

TASK 2: NOT BELIEF

John wants to look for his cattle at the pastures. They may be grazing around Mutero's area or around Chikoore's. John thinks they are **NOT** at Mutero's.

Memory Question

Where does John think they are grazing?

Belief Questions

- (a) Prediction: Where will John look for the cattle first? (Is it at Mutero's or Chikoore's?).
- (b) Justification : Why do you say that?

TASK 3: NOT OWN BELIEF

Ranga wants to look for his cattle in the pastures. They may be grazing around Mutero's area or around Chikoore's.

Memory Question

Where does Ranga think they are grazing?

Belief Questions

- (a) Prediction: Where will John look for the cattle first? (Is it at Mutero's or Chikoore's?)

If the child answers "at Mutero's" in (a) use the Chikoore location in (b). If he answers Chikoore, use Mutero location in the next question

- (b) Prediction: John thinks they are at (the opposite of the child's answer in (a) Where will John look for the cattle first?
- (c) Justification : Why do you say that?

TASK 4: CHANGED BELIEF

Chenjerai wants to look for his cattle at the pastures. They may be grazing around Mutero's area or around Chikoore's.

Memory Question

Where does Chenjerai think they are?

Belief Questions

- (a) Prediction: Where will Chenjerai look for the cattle first? (Is it at Mutero's or Chikoore's?)

However, before he leaves for the pastures, Rudo tells him that she saw them at Mutero/Chikoore (opposite of the location the child gives in (a). So now Chenjerai thinks that the cattle are in Mutero/Chikoore's pastures.

- (b) Prediction: Where will Chenjerai look for the cattle first?
- (c) Justification : Why do you say that?

APPENDIX III
WIMMER AND PERNER (1983) FALSE-BELIEF MEASURE: MODIFIED VERSION

APPENDIX III**Wimmer and Perner (1983) False-Belief Measure: Modified version**

Rudo has helped her mother to unpack the things they bought at the store.

"Mother where should I put these sweets?" Rudo asked.

"Put them in your black bag", mother replied.

Rudo takes the sweets and puts them in her black bag. Rudo remembers where she put the sweets so that she could come back to take some when she wants to eat them. Rudo loves to eat sweets. After packing the sweets, she goes to play. In her absence her mother took the sweets to give some to Rudo's younger sister Tsitsi. But Rudo's mother does not return the remaining sweets to Rudo's black bag. She put them in her own red bag and left for the well to fetch some water. While her mother is still at the well, Rudo comes back from the playground because she wants to eat some sweets. Rudo remembers exactly where she put the sweets before she went to play.

Memory Question:

- (a) Where are the sweets right now?

Belief Questions:

- (a) Prediction Where will Rudo look for the sweets first?
- b) Justification: Why do you say that?

APPENDIX IV

PERNER, LEEKAM AND WIMMER (1987) UNEXPECTED CHANGE MEASURE:
MODIFIED VERSION.

APPENDIX IV
Perner, Leekam and Wimmer (1987) Unexpected Change Measure
Modified Version.

Instructions to the test administrators

Take an empty Surf detergent box. Put a handful of soil in the box and close it carefully so that no soil shows from outside. Call a child and ask the following questions:

- (a) Prediction (self): What do you think is in the box?
- (b) Prediction: Representational change/stability: What did you think was in the box when you first saw it?
- (c) Prediction: (other minds): What do you think Mutsa (the child's peer or classmate) thinks is in the box when she first sees it?

APPENDIX V: RESPONSE SHEET

APPENDIX V: RESPONSE SHEET

1. Name: _____
2. Age: _____
3. Grade level: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 None ☐
4. Ethnic group 1 Shona ☐ 2 Ndebele ☐
5. Gender 1 male ☐ 2 Female ☐
6. Region: 1 Mash East ☐ 2 Manic. ☐ 3 Midl. ☐ 4 Mat. N ☐
- 7 Number of siblings: 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+ ☐
- 8 Religion: 1 Christianity ☐ 2 Traditional ☐ 3 Both ☐ 4 Others ☐

Wellman and Bartsch mental state attribution paradigm.**Task 1**

- (a) Prediction: 1 Chikoore ☐ 2. Mutero ☐ 3 Don't know ☐ 4 Non responsive ☐
- (b) Justification for response in (a): _____

Task 2

- (a) Prediction: 1 Chikoore ☐ 2 Mutero ☐ 3 Don't know ☐ 4 Non responsive ☐
- (b) Justification for response in a : _____

Task 3

- (a) Prediction (own) 1 Chikoore ☐ 2. Mutero ☐ 3 Don't know ☐ 4. Non responsive ☐
- (b) Prediction: 1 Chikoore ☐ 2. Mutero ☐ 3 Don't know ☐ 4 Non responsive ☐
- (c) Justification of response in (b): _____

Task 4

- (a) Prediction 1 Chikoore ☐ 2. Mutero ☐ 3 Don't know ☐ 4 Non responsive ☐
- (b) Prediction: 1 Chikoore ☐ 2. Mutero ☐ 3 Don't know ☐ 4 Non responsive ☐
- (c) Justification of response in (b) : _____

Wimmer and Perner: The False Belief Paradigm

- (a) Prediction: 1 red bag ☐ 2 black bag ☐ 3 I do not know ☐ 4 Non responsive ☐
- Justification for response in (a): _____

Perner, Leekam and Wimmer: Unexpected change task

- (a) Prediction (self): 1 Surf ☐ 2 I do not know ☐ 3 Non responsive ☐
- (b) Representational change/stability 1 Surf ☐ 2 I do not know ☐ 3 Non responsive ☐
- (c) Prediction (other minds) 1 surf ☐ 2 I do not know ☐ 3 Non responsive ☐

APPENDIX VI
PARENT CONSENT FOR SON OR DAUGHTER TO PARTICIPATE

APPENDIX VI

Parent Consent for Son or Daughter to participate

Dear Parent/Guardian:

I would like to request permission for your childto participate in a study about how children reason about the "mind". This study will help me to find out whether eight-year-olds in Zimbabwe use a system of reasoning about the mind called "Belief-desire".

The study will involve eight year olds from Mashonaland East, Manicaland, Midlands and Matebeleland North. Children will be told six short stories and then asked to answer some questions about those stories. The stories will be administered in two sessions. The study will also request information about the child's ethnicity, school experience, gender, region, religion, number of siblings and age.

This study is not assessing the performance of the child as an individual, but as part of a group of Zimbabwean children. There are no right and wrong answers to the questions. The study wants to find out what reasoning systems children use, and not whether they are using the correct or wrong system. The tasks are not harmful to children and are similar to those used by schools or in everyday conversations. The project has been approved by the Ministry of Primary and Secondary Education/the Government of Zimbabwe, Erikson Institute, Loyola University and your child's school.

Your child's participation is completely voluntary. There is no penalty from school the chief/headman or government if you or your child decides not to participate. The child may withdraw at any time during the study and refuse to answer any questions. Although the study will schedule the testing so that the child does not miss important lessons or chores. The total amount of time-on task is expected to be between ten to twenty minutes.

All information will be held as confidential. Only people involved in this project will have access to this information. Once the information has been collected, all reference to names will be removed and replaced by a case or code number. In addition, all publication (s) of information from this study will not identify the child by name, but code or case number.

I will also ask permission from your child to participate. A copy of that request is attached.

I would appreciate if you sign and return the attached form and return it to Att. Ms. Chipodyanda.

Department of Teacher Education,
University of Zimbabwe, Box MP. 167,
Mt Pleasant, Harare
Tel 303211.

Sincerely,

Chipodyanda
Graduate Student
Erikson Institute, Loyola University

☐ I have read the request for permission letter and I give permission for my son/daughter to participate.

☐ I do not give my child permission to participate

☐ I need some more information before my child can participate.

Parent/Guardian's signature_____

Date:_____

Child's Name:_____

Thank you very much for your cooperation

Adapted from Cone & Foster (1993) Dissertations from start to finish American Psychological Association: Washington, D.C.

APPENDIX VII
CHILD CONSENT FOR OWN PARTICIPATION.

APPENDIX VII
Child Consent for own participation.

Dear _____

Your parents have given their permission for you to take part in an activity I am doing with other eight-year olds from your school/area. I have six stories to tell you, and then I will ask some questions about the characters in the stories. The questions are not a test. I just want to find out what you think about the characters in the stories. Your friends will not be told about the answers you give me.

If you decide you do not want to take part any time during the activity, you can withdraw any time and if you do not want to answer any questions you may also refuse to answer them. You will not get punished by your parents or teachers if you refuse to participate or answer any questions. It is your choice to participate in this activity.

- ☐ Yes I want to do the activity
- ☐ No I do not want to do the activity

Thank you very much

Sincerely:

Ms. Chipo Dyanda

Signature: _____

Date: _____

Adapted from Cone & Foster (1993) Dissertations from start to finish American Psychological Association: Washington, D.C.

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The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that the necessary changes have been incorporated and that the dissertation is now given final approval by the committee with reference to the content and form.

The dissertation is, therefore, accepted in partial fulfilment of the requirements for the degree of Doctor of Philosophy.


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